AUGUST 9, 1954

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

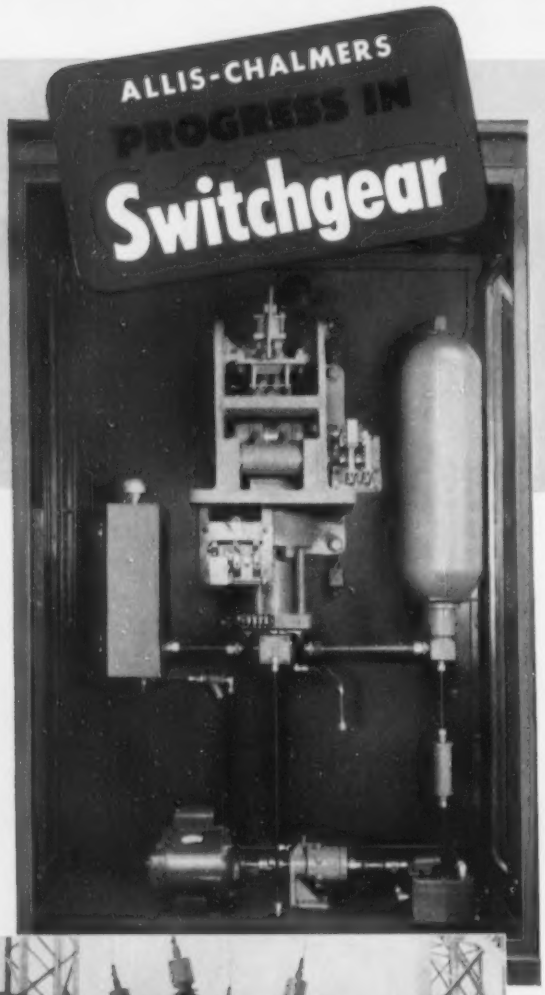
The Marriage of Efficient Modern Luminaires and Visual Environment with Latest Light Sources Results in...

- *Increased business*
- *Greater production*
- *Enhanced appearance*
- *Reduced maintenance*
- *Better morale*

• Manufacturers & Markets, a regular service, begins on page 124

"Pneu-Draulic" Operating Mechanism for Breakers

Looks Simple...IS SIMPLE!



Only 1 adjustment in hydraulic system...
to position the spool valve.

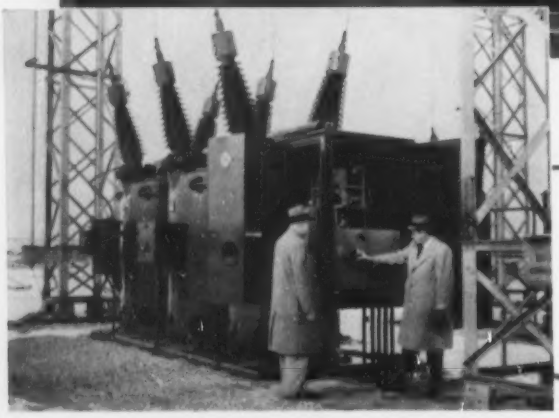
Only 2 moving parts in hydraulic control...
the spool valve and its control.

This simplicity of design was an important factor in the performance of *Pneu-Draulic* operators during the past year at an eastern power company. But this is only one part of the story of simplicity. It's simple to maintain as well.

Note the wide open accessibility — the short lengths of pipe — the few parts. In addition, the system eliminates basic causes for maintenance. Dirt hazard is eliminated. In effect, it's a sealed system with efficient filtering. Corrosion problems are reduced, since oil in the system uses one of the best corrosion inhibitors known. Moisture condensation problems are eliminated, since the system is filled with oil. Even manual closing is simpler, because provision for manual closing is built in.

Find out more about the breakers with the *Pneu-Draulic* operating mechanism. Call your nearby A-C office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4375

Pneu-Draulic is an Allis-Chalmers trademark.



New Operator Mechanism Has Excellent Record

Four 115-kv Allis-Chalmers circuit breakers at an eastern power company have operated almost a year with a total of over 4000 operations.

ALLIS-CHALMERS

A-C ALLIS CHALMERS

Electrical World

Vol. 142 No. 6 August 9, 1954

EDITORIALS — Pertinent comment on the industry's problems and accomplishments 77

THE ELECTRICAL WEEK — Last minute news briefly told 79

NEWS — Complete coverage of activities affecting the industry 80

FEATURES:

THERMAL STUDIES BOOST SUBSTATION RATINGS ..... A. F. Phillips 90

WELDED AL JOINTS STAND UP IN FOG ..... Roy K. Morten 94

POLE EXTENSIONS END NAVIGATION PERIL ..... I. L. Garcia 95

RELIGHTING BENEFITS BUSINESS ..... IES Contest Winners 97

STATISTICS — The industry's progress in figures 87

FINANCIAL — News of securities and financing 88

HOW TO — Practical ideas for those who design, construct, operate, and maintain 112

MANUFACTURERS & MARKETS — Information on electrical manufacturers and today's markets 124

INDUSTRIAL APPLICATIONS —Successful applications of electricity in industry 158

SALES AND SERVICE — Commercial, rural, and residential uses of electricity 162

NEWS ABOUT PEOPLE — Personnel changes throughout the industry 166

• • •

Washington Comment 86
Technical Notes 86
Engineering Reference Sheet ... 116
Meetings 110
New Equipment 146
Catalogs and Bulletins 156
Technical Literature 157
Letters 164

Index of Advertisers 175

Published for 80 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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This advertisement reproduced the results of tests made on an Okonite-Callender paper-insulated cable in 1949.

The advertisement reproduced here appeared five years ago. The story it told then remains true today—that is, that the first length of lead-sheathed cable furnished with an Okosheath Protective Covering back in 1933 is still operating successfully in a highly corrosive location. Since then, many hundreds of thousands of feet of cable protected by Okosheath Protective Covering have been installed, AND WE HAVE YET TO RECEIVE A REPORT THAT A SINGLE LENGTH HAS FAILED BECAUSE OF CORROSION.

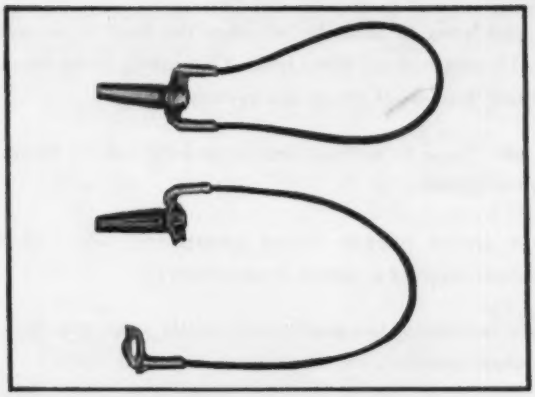
Today over half the lead-sheathed paper cables supplied by Okonite have Okosheath Protective Coverings specified by the user—not only to protect against corrosion and electrolysis, but to reduce the danger of sheath scoring during installation.

When the Okosheath Protective Covering is used in combination with an Okometal alloyed sheath, the composite construction permits a reduction in the thickness of metal required, and a corresponding saving in cost. Wherever a paper power cable is required, the advantages of Okonite's composite sheath should be considered. Detailed information may be obtained by writing for Bulletin EW-1047. The Okonite Company, Passaic, N.J.

1859-A

OKONITE SINCE 1878 *insulated cables*

Electroline
AUTOMATIC DEAD-END
for Neutral Supported Multiple Conductor Service-Drop Cable



THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

WRITE FOR NEW BULLETINS FOR FULL INFORMATION

TALENT TO ORIGINATE E ABILITY TO PRODUCE

Electroline Company

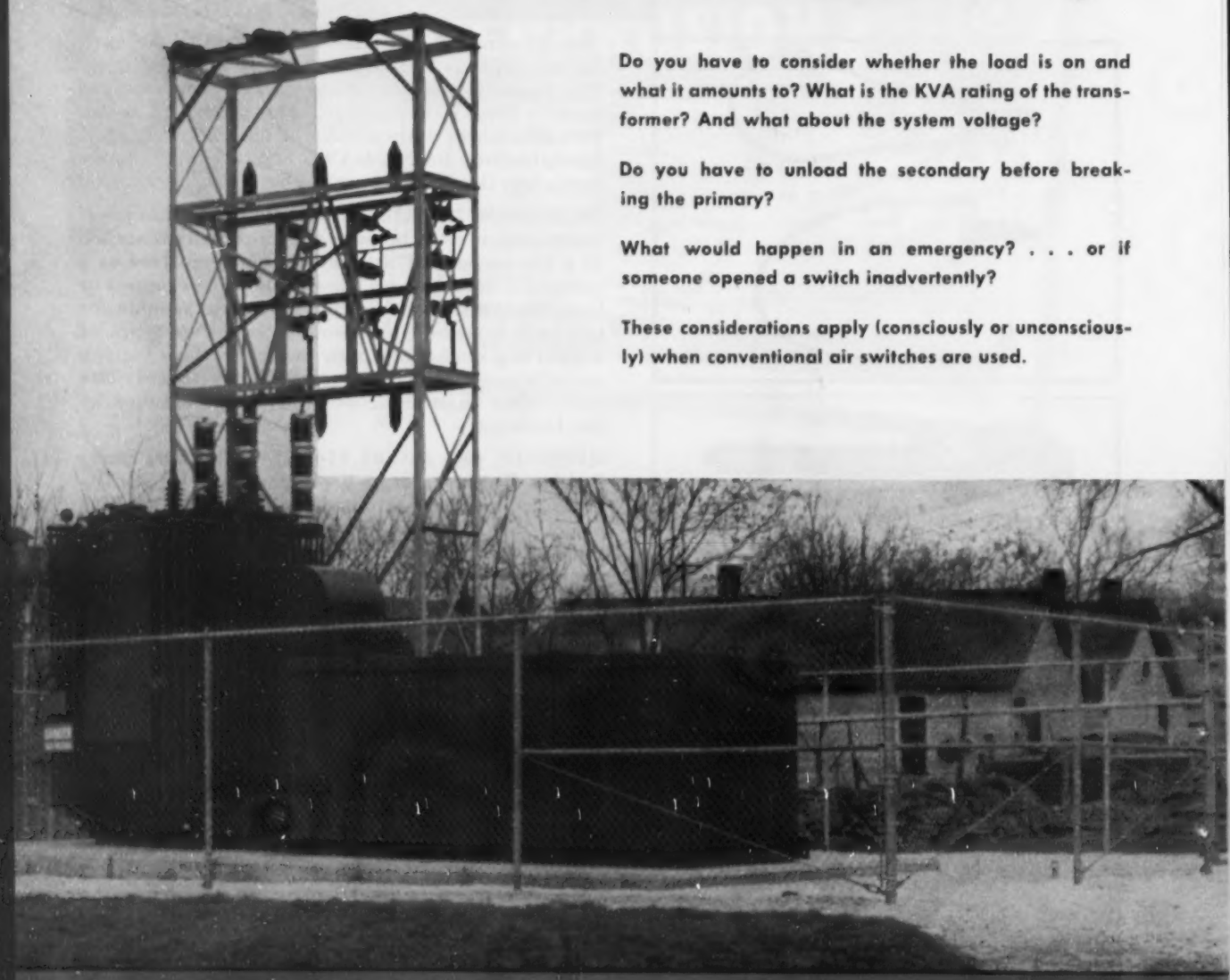
4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

In Your Distribution Substations

WHAT DOES IT TAKE

to Switch the Primary?



Do you have to consider whether the load is on and what it amounts to? What is the KVA rating of the transformer? And what about the system voltage?

Do you have to unload the secondary before breaking the primary?

What would happen in an emergency? . . . or if someone opened a switch inadvertently?

These considerations apply (consciously or unconsciously) when conventional air switches are used.

SPECIALISTS IN HIGH-VOLTAGE

The S&C LOAD INTERRUPTER takes nothing but a pull on the handle

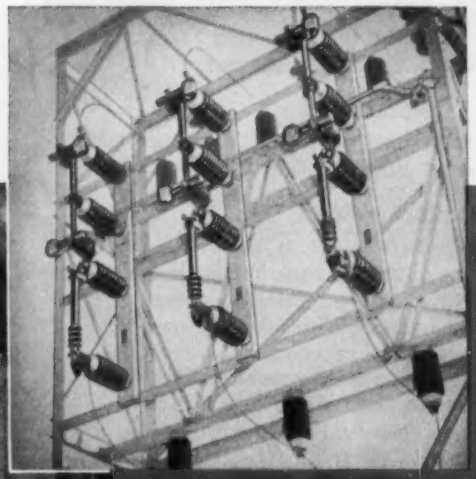
● The S&C Load Interrupter (Alduti Type) can break the primary circuit of a distribution substation any time under any condition (except short circuit). Switching cannot lead to dangerous phase-to-phase or phase-to-ground faults. It cannot endanger men or equipment.

● When you break the magnetizing current, the break is positive—clean—decisive. (You don't have to "dog" it as a preliminary.) You are completely independent of wind velocity and wind direction.

● Then too you can break the magnetizing current of the larger transformers—an impossibility with conventional air switches.

● Under emergency conditions—or for protection against inadvertent operation—you can interrupt the entire load current of the substation. Thus you have two ways to drop the load—on either primary or secondary.

Do you have these operating advantages at your substations?



Inset shows a close-up of S&C Load Interrupters in service on the primary of a typical distribution substation.

S&C Interrupters bring new concepts of operating convenience, and new thinking in system layout. We will gladly send you this booklet containing detailed information about them.

S&C

ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE
CHICAGO 40, ILLINOIS, U.S.A.
formerly Schweitzer & Conrad, Inc.

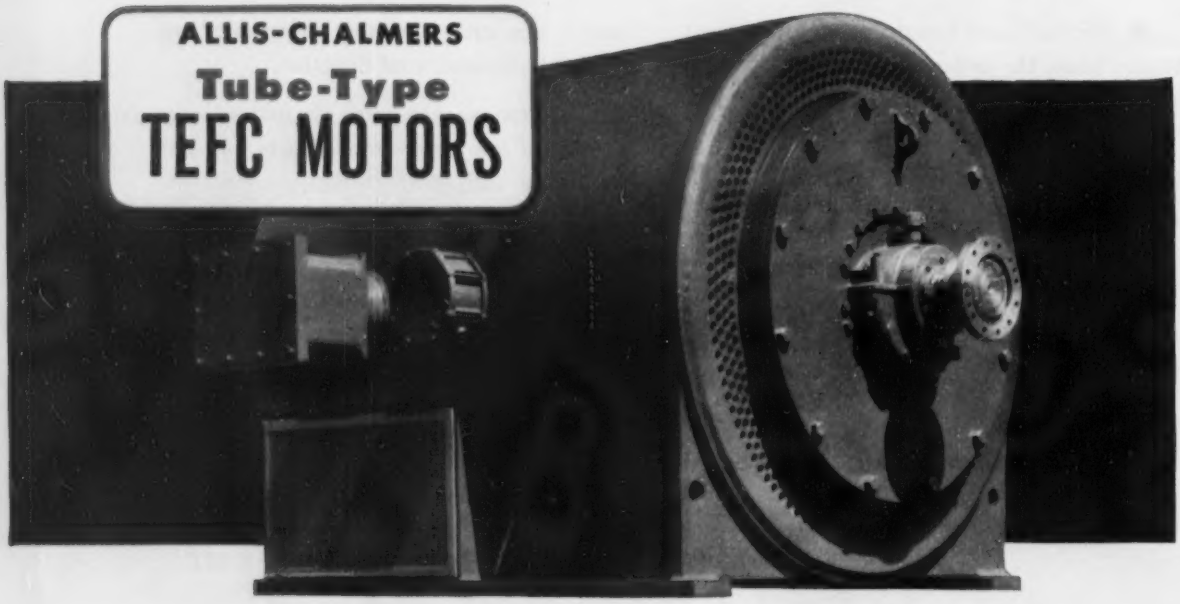
IN CANADA, S&C ELECTRIC CANADA, LTD.
8 VANSCO ROAD, TORONTO 14, ONTARIO

CIRCUIT INTERRUPTION

NOW 1250 Hp – 1780 Rpm

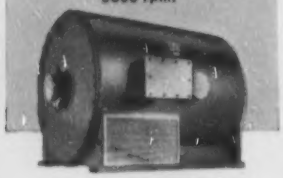
Underwriters' Approved

for Class I, Group D Service



Allis-Chalmers explosion-proof motors as large as 1250 hp, 2300 volts, 1780 rpm are now available with Underwriters' Laboratories, Inc. labels for operation in Class I, Group D hazardous locations.

Ratings up to 800 hp, 3600 rpm.



Construction used for larger ratings.

Previous to recent tests, the Allis-Chalmers Underwriter-approved motor line included ratings up to 800 hp, 3600 rpm for operation in Class I, Group D and Class II, Group F and G locations. Now, with the design used for larger ratings also Underwriters' test-proved, Allis-Chalmers can supply explosion-proof motors in other ratings required by industry.

Explosion-Proof Plus

Operation-proved by TEFC motors totaling over a quarter million horsepower, the A-C tube-type air-to-air heat exchanger design combines safety and maximum operating economy. Self-cleaning action cuts maintenance. Full internal air circulation lengthens insulation life. Complete enclosure protects stator core and other electrical parts from dirt and corrosion.

For approved motors for hazardous dust and gas locations, contact your A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

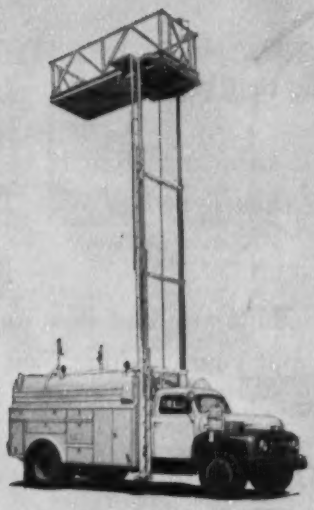
A-4436

ALLIS-CHALMERS

POWERS American AERIAL EQUIPMENT

AERIAL TOWERS

Series 7A-01 . . . in sizes for safe, smooth elevation to 21′ or 25′. Equipped with telescopic ladder. Operation from cab or tower. Platform revolves 360°.



HYDRAULIC AERIAL TOWERS

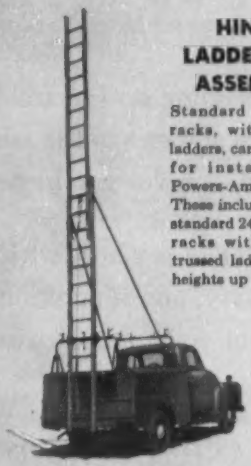
Series TW-2 . . . enables workmen to reach areas more than 35′ above ground. Can be operated from tower or truck cab. Platform revolves full 360°. Telescopic ladder is standard equipment.

REVOLVING Fully-Powered HYDRAULIC AERIAL LADDERS

Series HL-35 . . . elevates, extends, lowers, and retracts by *hydraulic power*. Available in sizes having ground-to-platform height up to 35′. Revolves full 360°.

REVOLVING AERIAL LADDERS

Series 5510 . . . perfectly balanced to permit fast, easy elevation. In sizes having 23′6″, 26′6″, and 30′6″ ground-to-platform height. Can be spotted at angles from 30° to 75°, and revolved full 360°.



HINGED LADDER RACK ASSEMBLIES

Standard and special racks, with extension ladders, can be furnished for installation on Powers-American bodies. These include racks with standard 24′ ladders, and racks with braced or trussed ladders to reach heights up to 30′.

A descriptive bulletin is available on each item of aerial equipment in the Powers-American line. Bulletins, plus prices and complete details, are yours for the asking.

McCABE-POWERS AUTO BODY COMPANY

MAIN OFFICE
5900 NO. BROADWAY • ST. LOUIS 15, MO.

WESTERN OFFICE
428 LATHAM SQ. BLDG. • OAKLAND 12, CALIF.

It's Fun to Be FIRST!

Even though Simplex has proudly announced many "Firsts," somehow the thrill never wears off. That's why we're so proud of our latest "First," announced last fall. It is the approval by the Underwriters' of Simplex WD-75 Wire as "Type RHW." It is the first wire to bear this approval.

Obviously a new product should do something for you that an old one doesn't do. Here's what Simplex WD-75 Wire will do:

- It can be used as general-purpose wire in BOTH wet or dry locations at a copper temperature of 167° F. (75° C.). No wire was approved to do that before.
- Depending on the ambient temperature, Simplex WD-75 can carry from 18 to 52% more amperes in the same size conductor in wet locations than Type RW Wire. That's good — saves you money, too.

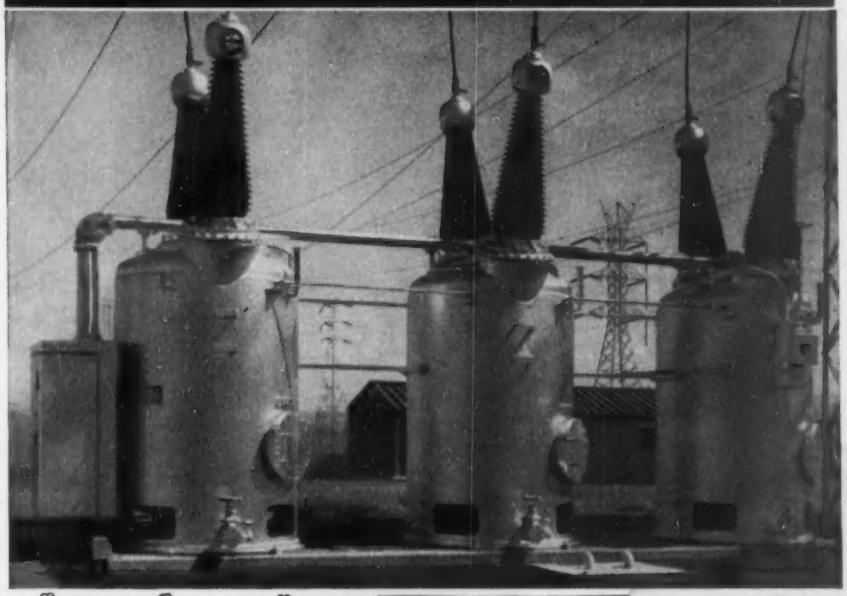
Simplex WD-75 is gentle with remodeling costs, too. If your conduits are filled now to their rated capacity, and if additional amperes are needed, *don't* tear out your conduits. You need only pull out your present wire and pull in Simplex WD-75.

Simplex makes Type RHW Wire as ANHYDROPRENE WD-75 for use in conduits and ducts, and ANHYDREX WD-75 for direct burial in the ground. Simplex folder No. 1018 has more details about this wire. Why don't you write for it today?

Simplex **ANHYDROPRENE WD-75**
ANHYDREX WD-75

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Oil-Hydraulic Energy Transfer and Control of End-of-Stroke Conditions



PACIFIC ELECTRIC Type RHE CIRCUIT BREAKERS

115 to 230 kv
3 cycle
to 10,000,000
interrupting kva
(at 161 or 230 kv)

Ground-mounted (as illustrated) or common-base mounted (115, 138, and 161 kv)

At left:
Type RHE 196/230 kv
3-cycle, 7,500,000 int. kva
10-cycle closing
20-cycle reclosing

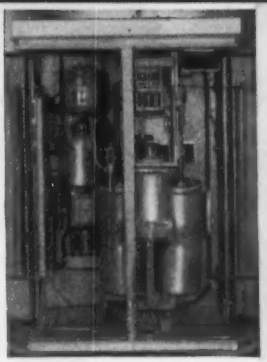
Multi-Use of Oil-Hydraulic Cylinder

UP STROKE Energy transfer to closing springs

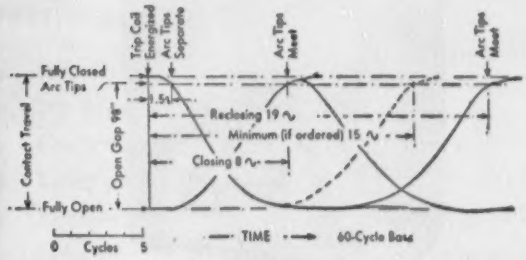
During DOWN STROKE Energy transfer to opening springs

Toward end of DOWN STROKE Orifice restriction absorbs shock

At right:
Operating Mechanism with Doors Open



Below: Contact-travel time chart showing open-close and close-open operations with oil in tanks



FAST Opening . . . Important? . . . Yes!

But equally important is stopping the mechanism so it comes to rest without undue shock or rebound. Also the breaker should *open fully* before reclosing to prevent impairment of insulation during the critical surge time that follows interruption caused by repetitive lightning.

How well Pacific Type RHE breakers perform in these respects is shown in the time-travel diagram at right.

Oil-hydraulic control of these end-of-stroke conditions is the reason why. The same oil-hydraulic cylinder and piston serves the dual purpose of (1) transferring closing energy to the closing springs on the up-stroke, and (2) decelerating the contact mechanism toward the end of the down stroke (see schematic diagrams at left).

OTHER FEATURES:

- Opening and closing springs and shock absorbers are outside of the tanks
- Nested Sliding Shoe (finger) Contacts
- Improved Interrupters
- Easy manual emergency operation for load switching as well as for test.

Since 1906

SALES OFFICES or AGENCIES in PRINCIPAL CITIES

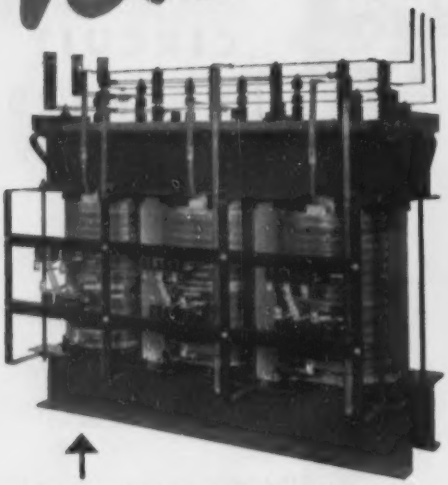
PACIFIC ELECTRIC • MFG. CORPORATION •

SUBSIDIARY OF FEDERAL ELECTRIC PRODUCTS COMPANY

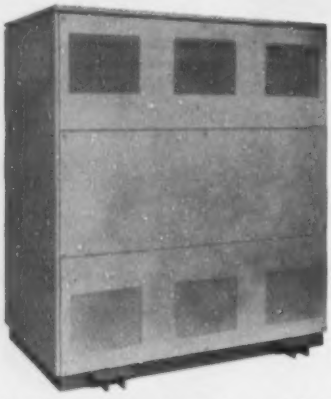
5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA

OTHER FACTORIES: SANTA CLARA, CALIF.; SCRANTON, PENNA.

Now...84 Pennsylvania

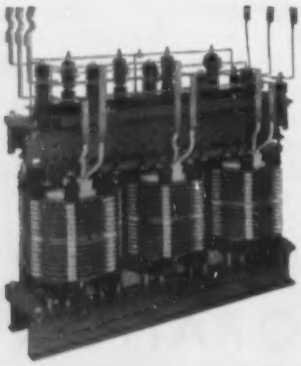


2000 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
2400Δ-480Δ volts.
Station auxiliary, sealed-in-nitrogen.



1000 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
12,470Y-480Δ volts.
Unit substation service, ventilated type.

1000 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
12,000Δ-480Y/277 volts.
Unit substation service, sealed-in-nitrogen.



500 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
2400Δ/4160Y-480Δ volts.
Network, submersible, sealed-in-nitrogen.

500 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
12,500Δ-216Y/125 volts.
Network, submersible, sealed-in-nitrogen.

CLASS H Transformers

in Service... Including 4-2000 kva Units

The Largest Class H Transformers Ever Built

No doubt about it — Class H transformers are the greatest transformer development of the last decade. Nothing like it has captured the imagination of the transformer industry since the introduction of cold rolled steel.

Pennsylvania Transformer engineers have pioneered the development of Class H insulating materials and are credited with designing and placing into service the world's largest Class H units.

Eighty-four Pennsylvania Class H transformers, ranging in size from 250 Kva through 2000 Kva — up to and including 15 Kv — are installed in unit substations, network systems, and generating stations throughout the country. The trouble-free operating record of every one of these units is substantial proof of the outstanding electrical and mechanical designs of Pennsylvania Class H Transformers.

Among the many advantages of Class H Transformers are the following:

- Safest transformers ever developed;
- No fire or explosion hazard;
- Carry the lowest fire insurance rates;
- Least affected by water;
- Exceptionally high overload capacities;
- Minimum maintenance — even in highly contaminated areas.

PENNSYLVANIA CLASS H TRANSFORMERS are available in the following sizes:

	KVA	VOLTAGE
Ventilated	Up to 3000	Up to 15 Kv
Sealed-in-Nitrogen	Up to 2000	Up to 15 Kv

For further information on Pennsylvania Class H transformers, we invite you to write to Pennsylvania Transformer Company, Box 330, Canonsburg, Pa., and ask for your free copy of Bulletin 951 — "H . . . in a Class by Itself."

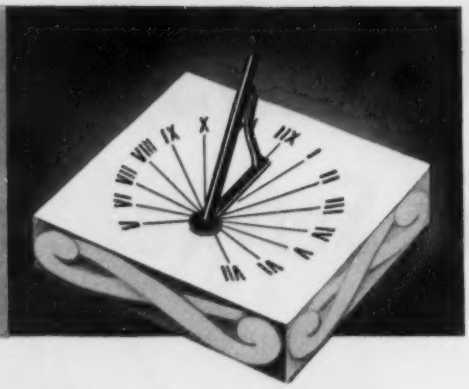
PENNSYLVANIA TRANSFORMER COMPANY

A McGRAW ELECTRIC COMPANY DIVISION

CANONSBURG, PENNSYLVANIA • ***Greater Pittsburgh District***

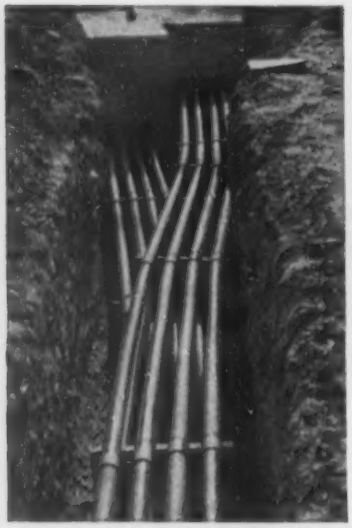
QUALITY

...proved by TIME...



Of course the most convincing proof of Orangeburg's enduring quality is its 60-year record of service to leading Public Utilities, Municipalities and Contractors.

Quality stands out in every feature. Orangeburg Fibre Conduit is lightweight yet strong, tough and resilient. Its impermeable walls and tight joints keep out corrosive ground waters. Its smooth bore and low coefficient of friction protect cable sheaths from abrasion. Orangeburg material resists acids, alkalies, salt, grease and oil.



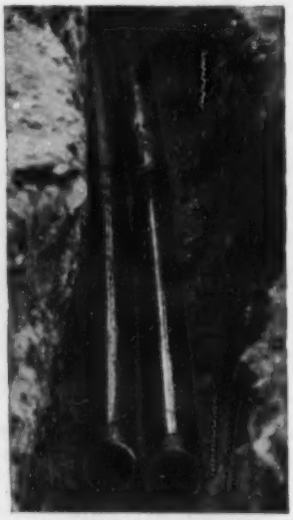
ORANGEBURG STANDARD is installed with concrete encasement. Preferred for banks of three or more ducts.

For these and other advantages Orangeburg provides complete security for electrical services underground. Result...no interruption of power. These vital services keep flowing.

SAVES MONEY, TOO!

Saves by prolonging cable life . . . by faster and easier handling, tooling and laying . . . and by the use of Orangeburg's standard fittings. They cut costs by simplifying installation. Send to Dept. EW84 for more facts.

ORANGEBURG MANUFACTURING CO., INC.
Orangeburg, New York
West Coast Plant — Newark, California



ORANGEBURG NOCRETE is installed without concrete encasement. Extra heavy wall for direct burial.

ORANGEBURG®
FIBRE CONDUIT

STANDARD INSTALLED WITH CONCRETE

NOCRETE INSTALLED WITHOUT CONCRETE

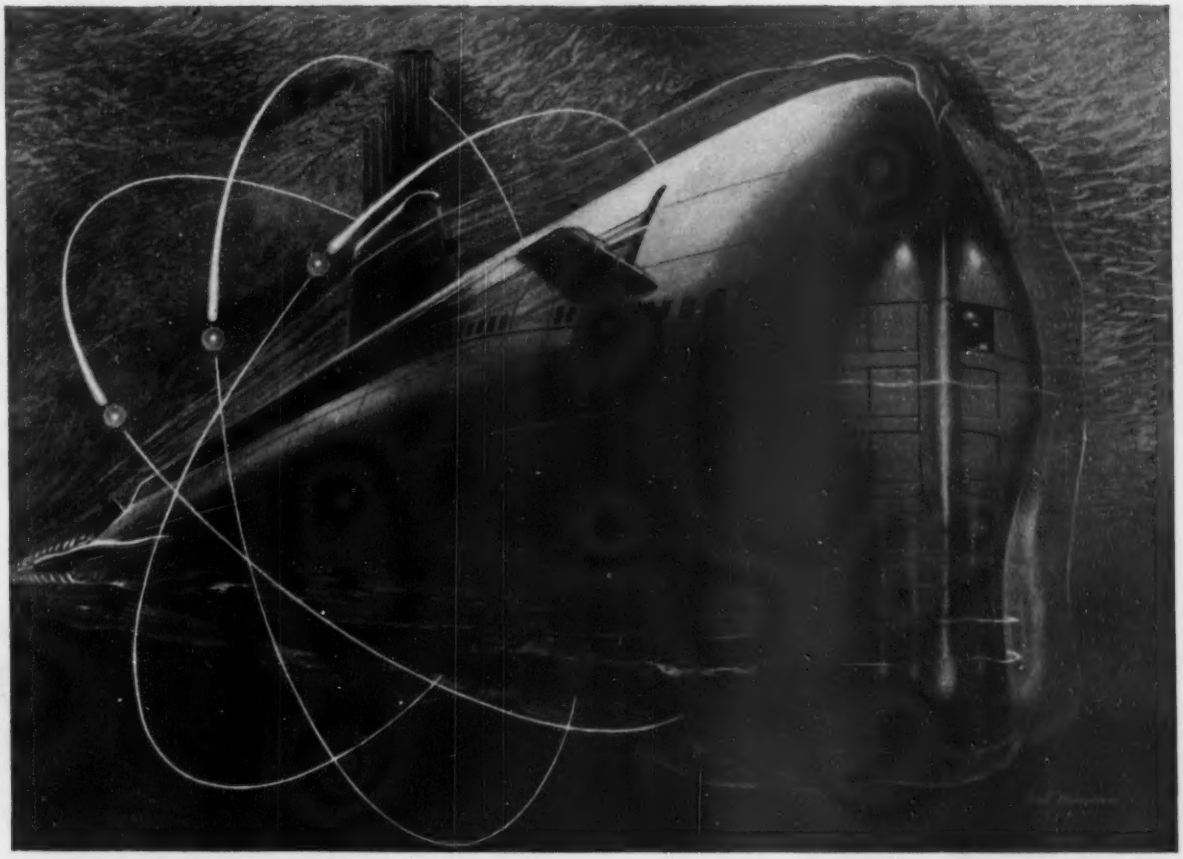
Graybar ELECTRIC COMPANY

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY COMPANY

A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION



ATOMIC SUB BUILDERS

Rely on World's Greatest Lubrication Knowledge and Engineering Service

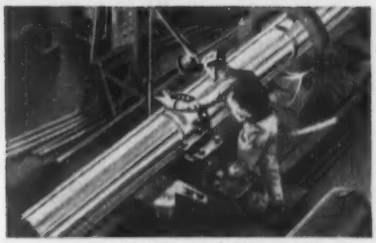
AFTER 54 years of building over 300 "conventional" submarines for the U. S. Navy and our allies, Electric Boat Division, General Dynamics Corp., marks its entry into the atomic age with the launching of the "Nautilus"—world's first atomic powered submarine.

Electric Boat, with its sprawling foundries and shops along the Thames River at Groton, Conn., is really many industries in one. It casts its own metals—both ferrous and non-ferrous. It shapes and machines metal parts—from thick armor plate to parts with microscopic tolerances. It has 27 overhead cranes, marine railway and land railroads, a fleet of trucks, low- and high-pressure compressors, its own Diesel power plant.

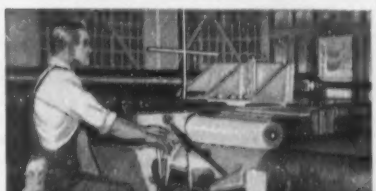
This wide variety of costly machinery represents almost every lubrication condition found in modern industry. That is why Electric Boat relies 100% on Gargoyle lubricants and a program of Correct Lubrication—has done so for 34 years.

★ ★ ★

You can give your plant, mine or mill this same unsurpassed protection. Just call your Socony-Vacuum representative.



A snorkel intake tube being machined to very precise tolerances on one of the large lathes in the Groton plant.



Hydraulic bender shapes section of 8-in. steel pipe in two minutes. This operation formerly took a full day.

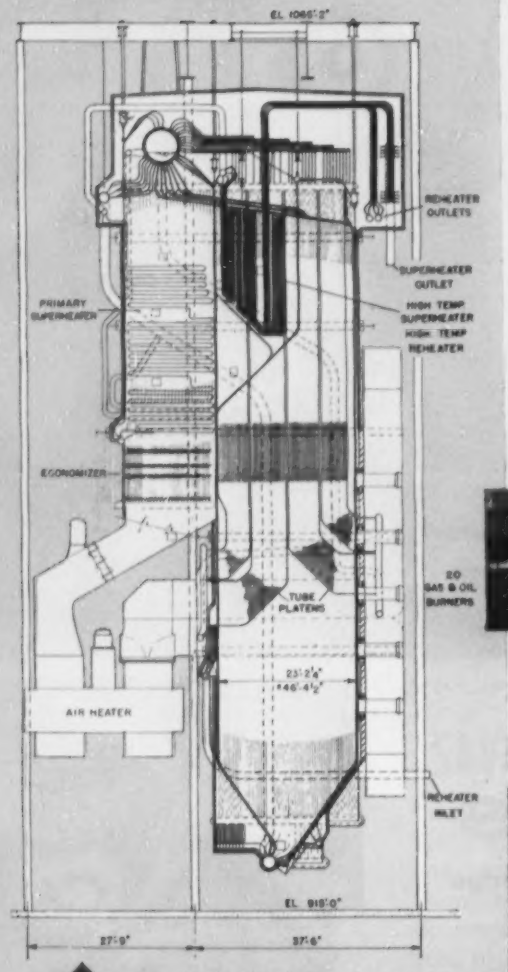
SOCONY-VACUUM *Correct Lubrication*

FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

SOCONY-VACUUM

Join the SWING to RILEY

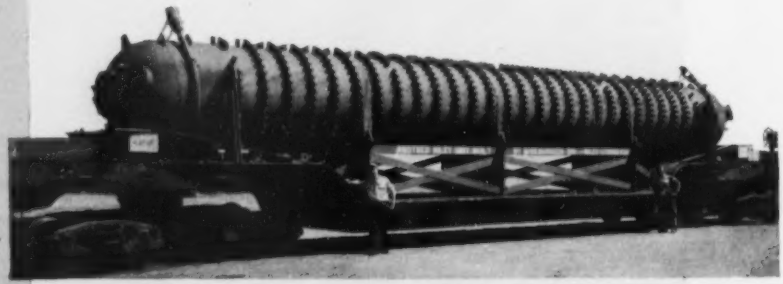


Los Angeles Department of Water & Power—Valley Steam Plant. Two 1,200,000 lbs./hr. 1850 psig. 1000F-1000F reheat. Fired by gas & oil. Riley Single Header Hopper for future conversion to Pulverized Coal. Temperature control by differential firing in divided furnaces.

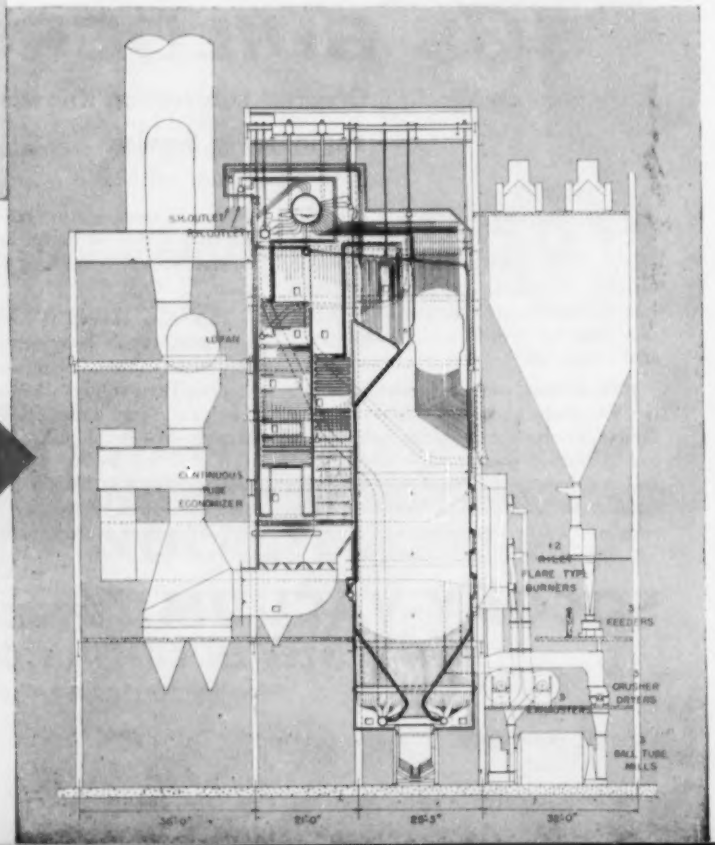
Public Service Co. of Indiana, Inc. Wabash River Station. 805,000 lbs./hr. 2075 psig design, 1005F-1005F reheat. Fired by 12 Riley Flare Type Burners, 3 Riley Pulverizers. Sargent & Lundy, Engineers.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs.

This acceptance of Riley Reheat Units by the public utilities — this marked swing to Riley has been brought about by the outstanding design characteristics of Riley reheat units — low furnace exit temperatures through the use of radiant surface preventing objectionable slag formation; wide load range with stable ignition with damper or combination of damper and spray control; high yearly net efficiency, dependability and continuity of operation.

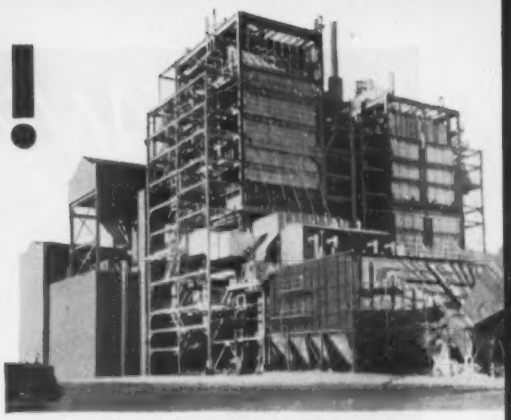


Riley designs, fabricates and erects the complete steam generating unit. Here you see the huge steam drum weighing 127 tons, 60'-0" long, 66" I.D. with 5-3/32" thick steel walls recently fabricated by Riley for one of two Riley reheat units at Los Angeles Water & Power Department's new Valley Steam Plant.

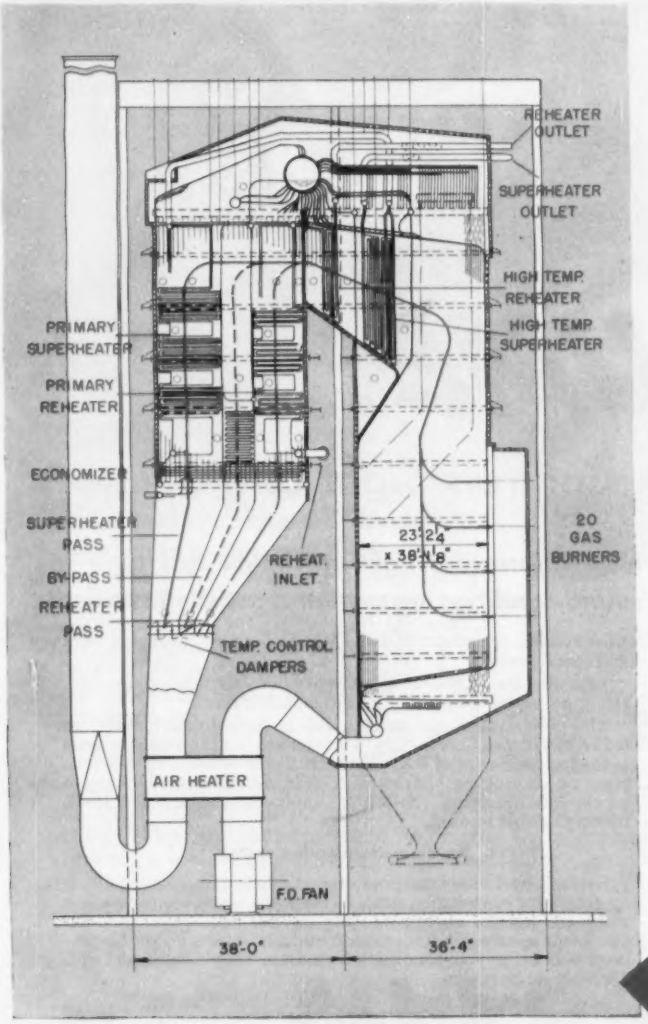


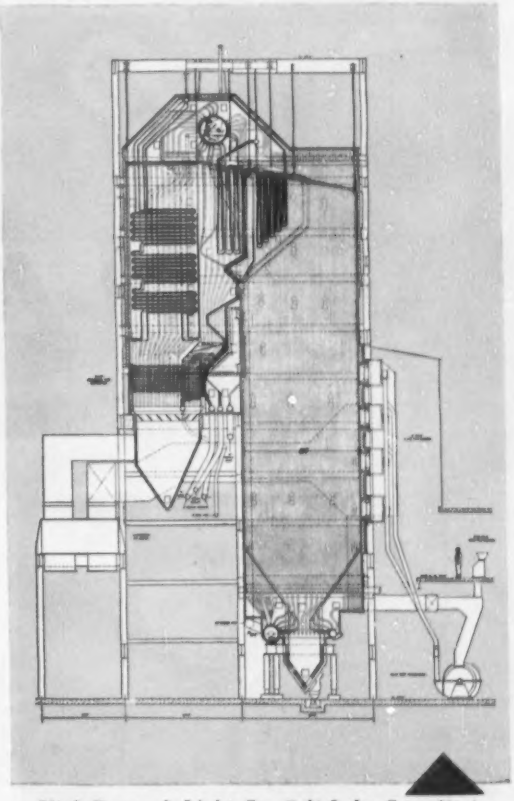
REHEAT UNITS!

a large percentage of all reheat units purchased by public utilities during 1953 were Riley units.



Completely outdoor construction is a feature of the two Riley units at Utah Power & Light Company — Gadsby Station





Utah Power & Light Co., Salt Lake City, Utah
Gadsby Station—575,000 lbs./hr. 1700 psig
1000F-1000F reheat, Riley "50" Pulverizers.
Bechtel Corporation Engineers

Louisiana Power & Light Co.—Nine Mile Point Station
1,000,000 lbs./hr. 1725 psig. 1000F-1000F reheat
Fired by gas & oil. Ebasco Services, Engineers

RILEY *Stoker Corporation*

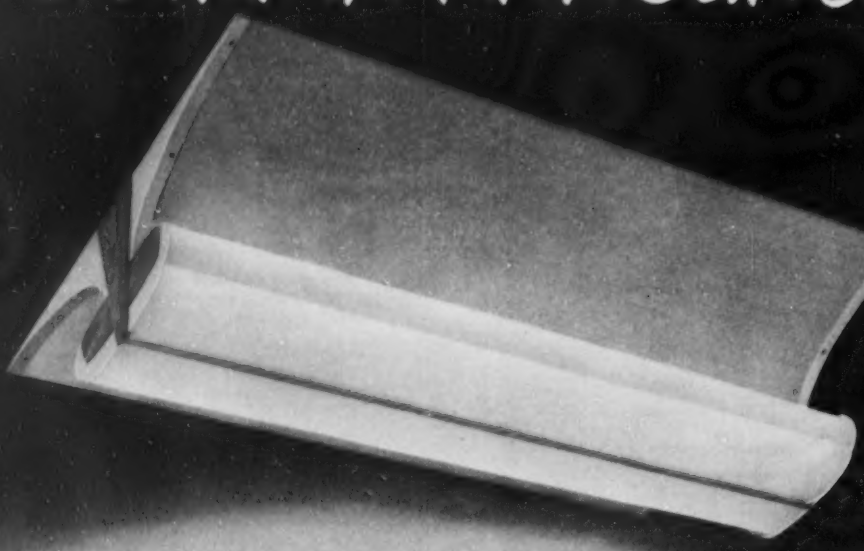
WORCESTER, MASSACHUSETTS

Boston New York Philadelphia Buffalo Washington Pittsburgh Cleveland Detroit Chicago Cincinnati Charlotte New Orleans
Atlanta St. Louis Kansas City St. Paul Tulsa Houston Denver Salt Lake City Los Angeles San Francisco Portland Seattle

COMPLETE STEAM GENERATING UNITS

AND FUEL BURNING EQUIPMENT FOR PUBLIC UTILITIES, INDUSTRIAL POWER AND HEATING PLANTS

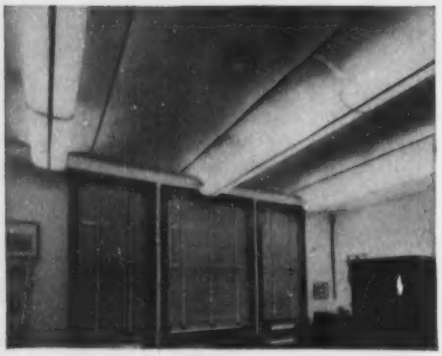
SYLVANIA ANNOUNCES—



Close-up of Sylvania Sono-Lume unit showing perforated metal wings backed with sound-deadening glass fiber batting. Fixtures may be also equipped with louvers instead of plastic shielding. Mounted singly or in continuous rows.

SONO-LUME*.....

the Fixture† which Controls Sight and Sound!



New fluorescent lighting fixture has built-in sound-conditioning system . . . easily installed!

Now Sylvania introduces SONO-LUME . . . a new concept of sight and sound control!

Basically, Sono-Lume is an attractive fluorescent fixture incorporating principles worked out by Sylvania engineers.

The perforated wings on each side of Sono-Lume fixtures are backed with glass fiber batting. This element has the excellent noise reduction coefficient of 0.85. Thus the fixture serves a double purpose: (1) It provides high levels of clear, soft, all-over illumination for comfortable seeing. (2) It holds unnecessary noise to low levels for comfortable hearing.

Saves modernization costs!

Sylvania Sono-Lume fixtures can be readily installed in any office, conference or consultation room. In instances where sound-proofing and better lighting are separate projects, this new combination fixture keeps costs well within modest budgets. A note on your letterhead will bring you detailed information. Simply address Dept. 4X2820, at Sylvania.

LIGHTING CONTRACTOR — SYLVANIA

Look for this emblem—your guide to a Qualified Lighting Contractor.

*Sylvania Trade Mark
†Patent Pending

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.

LIGHTING · RADIO · ELECTRONICS · TELEVISION

3500 C for 30 Seconds

This Molded Current Transformer Meets Fire Test

Allis-Chalmers thru-type molded current transformers can cause no fire hazard. Recent tests prove they will not support combustion or add to the intensity of a fire — an important thing to look for in a current transformer.

Hold More Conductors

Allis-Chalmers thru-type molded resin transformers hold more conductors than any other thru-type current transformer of corresponding rating now on the market. The oval window is large enough to hold two 500 MCM stranded conductors for any current rating in the 600-volt insulation class.

High Metering Accuracy

These transformers provide accuracy with the burden of one or more watthour meters. They are manufactured in four primary current ratings, with intermediate ratings available by passing the primary conductor through the window two or more times. Installation is simple and maintenance has been completely eliminated — no painting is required. Get complete facts from your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 61B8080. A-4385

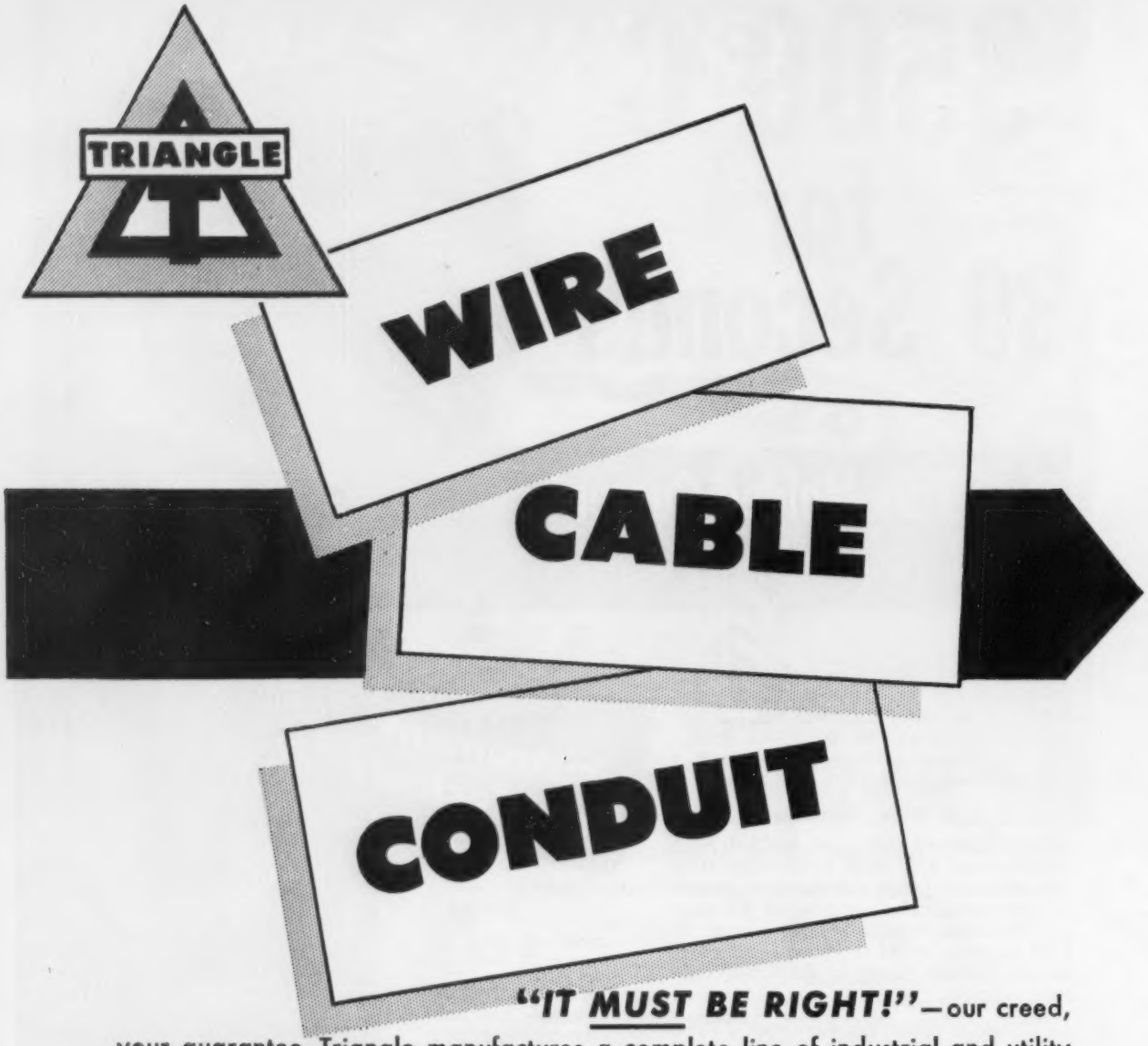
ALLIS-CHALMERS

Outdoor current transformers, Type KO, rated up to 15 kv and 1800 amp.

Indoor potential transformers, Type PD, rated up to 14,400 volts, 200 va, fused or unfused.

Outdoor potential transformers, Type PWD, rated up to 15 kv, 200 va.

Over 400 Types and Ratings



"IT MUST BE RIGHT!"—our creed, your guarantee. Triangle manufactures a complete line of industrial and utility cables as well as all types of building wire and conduit. For quality, long life and customer satisfaction, remember, if it's made by Triangle—It MUST Be Right!

TRIANGLE ELECTRICAL PRODUCTS—

INDUSTRIAL AND UTILITY CABLES

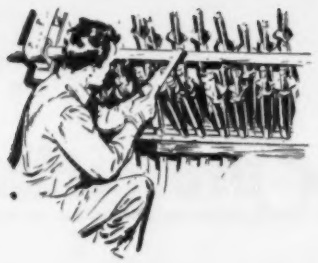
RUBBER AND LEAD CABLE
VARNISHED CAMBRIC—Braided
VARNISHED CAMBRIC—Lead Covered
POWER CABLE—Tape and Braid
POWER CABLE—Lead Covered
TRIOPRENE—Non-Metallic Trench Cable
TRIOPRENE Dual-Rated Cable
PARKWAY CABLE—Lead and Jute, Steel Taped
PARKWAY CABLE—Neoprene and Jute Steel Taped
V. C. INTERLOCKED ARMORED CABLE
LEAD ARMORED CABLE
CONTROL CABLE
NEOPRENE LINE WIRE
SELF SUPPORTING SERVICE DROP CABLE
STREET LIGHTING CABLE

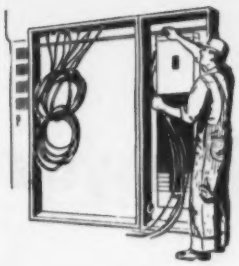
BUILDING WIRE

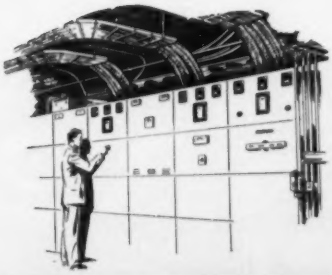
FIXTURE WIRE
GLAZON WIRE—Types R, RP, RH-RW
TRIOSEAL WIRE—Type TW
RUBBER COVERED WIRE—Types R, RP, RH-RW
GLAZON TRIEX—Non-Metallic Sheathed Cable
GLAZON THERMO-TRIEX—Non-Metallic Sheathed Cable (Type TW insulation)
SERVICE ENTRANCE CABLE
SERVICE DROP CABLE
ARMORED CABLE
DUPLEX CABLE—Types RD, RHD-RWD

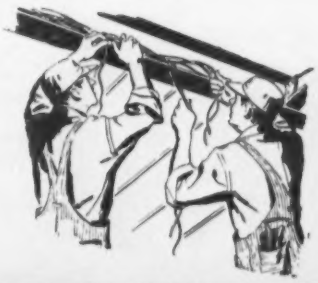
CONDUIT

RIGID—Hot Dipped Galvanized or Black Enameled
THIN WALL CONDUIT (E.M.T.)—Electro-Galvanized
TRISTEEL—Flexible Steel Conduit



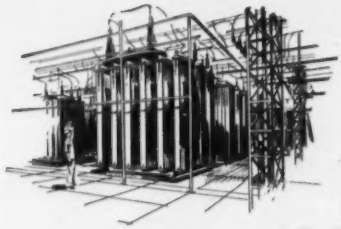


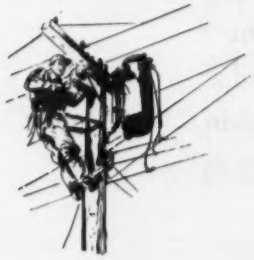


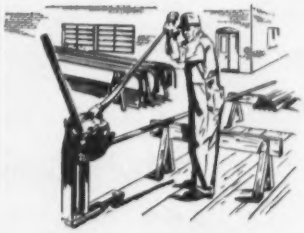


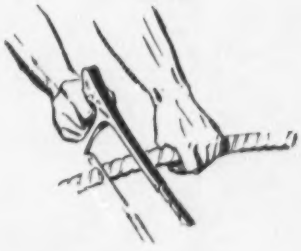
For INDUSTRY | **For BUSINESS** | **For THE HOME**

Remember*—IF IT'S MADE BY TRIANGLE—*IT MUST BE RIGHT!









It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE ®

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, N. J.

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

PLANTS — NEW BRUNSWICK, N. J.: WIRE AND CABLE PLANT • ROD MILL • BRASS AND COPPER TUBE MILL • PLASTIC PIPE PLANT • **MOUNDSVILLE, W. VA.:** CONDUIT PLANT
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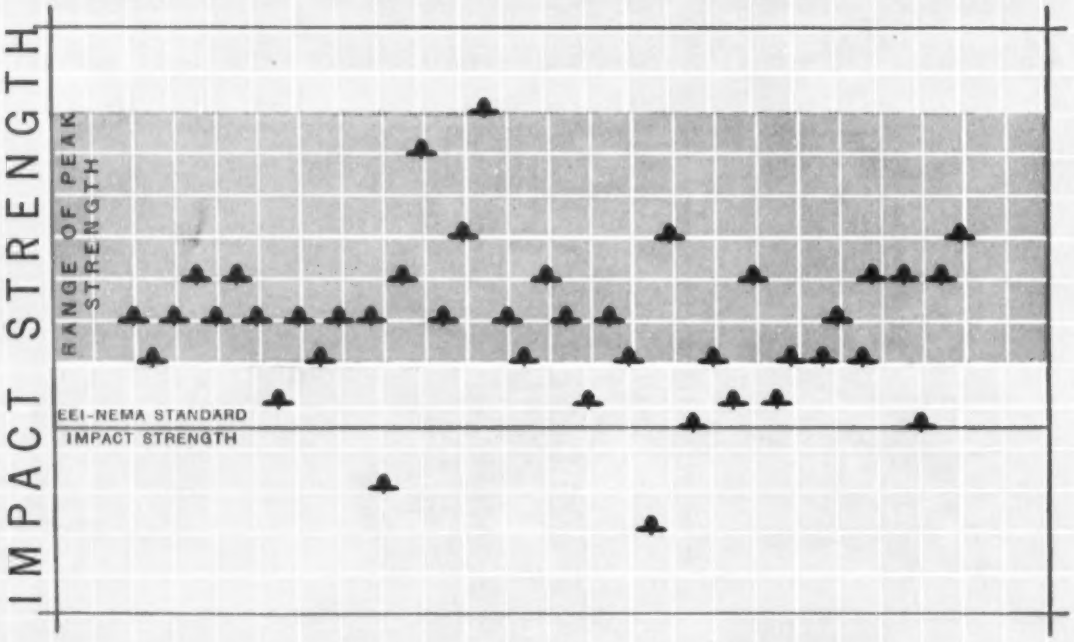
Sponsors of the famous Triangle Invitation Round Robin Tournament for professional women golfers. Held this year, June 3–6, at the Homestead, Virginia Hot Springs.

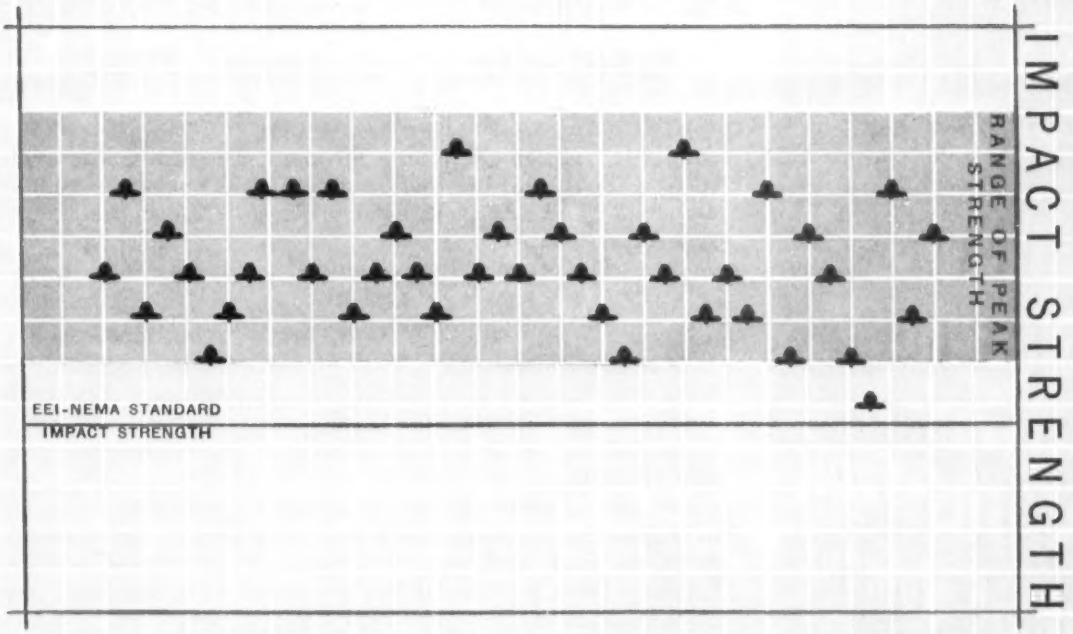
LOCKE gives you *new protection*

Impact strength of any suspension insulator now on your lines may fall well below the range of peak impact strength, as shown here by test results of representative industry samples of 10" suspension insulators.*



***FOR FURTHER DETAILS ASK YOUR LOCKE SALES REPRESENTATIVE**

against insulator failure



AIEE standard tests reveal 98% of new 10" MICROGLAZE† Suspension Insulators fall within the range of peak impact strength.* Microscopic control of glaze thickness makes the big difference! Next time, specify MICROGLAZE Suspension Insulators...your best insurance yet against the hazards of mechanical impact.

Don't miss Locke's ½ hour color film--
"The Story of Microglaze Insulators"

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

†Trademark of General Electric Company

Now!...

An INTERRUPTING RATING in EXCESS of 100,000 AMPERES *for every set of fuse clips in your plant* . . . simply by installing FUSETRON *dual-element* FUSES

The Biggest Electrical Protection NEWS Since BUSS invented the FUSETRON Dual-Element FUSE

FUSETRON is a trademark of the Bussmann Mfg. Co., Division of McGraw Electric Co.

In 1947 tests made by the Electrical Testing Laboratories of New York, showed that on a circuit set to deliver 50,000 amperes, FUSETRON fuses in all tests cleared the circuit safely.

50,000 amp. Interrupting Capacity in 1947
becomes
100,000 amp. Interrupting Capacity Today

After years of intensive development work on FUSETRON fuses new tests were conducted under conditions that simulated the most severe field conditions and these tests were witnessed and verified by the Electrical Testing Laboratories of New York.

On circuits set to deliver in excess of 100,000 amperes, 30 to 600 ampere, 250 and 600 volt FUSETRON dual-element Fuses on each and every test cleared the circuit without belching flame or venting hot gases and with comparatively little noise.

Oscillograms of these tests interpreted by the Electrical Testing Laboratories, showed that the total available amperes including the direct current component, reached values as great as 165,000 peak amperes on 240 volt tests and as high as 212,000 peak amperes on the 535 volt tests.

This indicates that an interrupting rating of 100,000 amperes for FUSETRON dual-element fuses is a conservative one.

No interference with time-lag

In the development work to increase interrupting capacity in FUSETRON fuses it was kept in mind that the time-current characteristic must be maintained. Time-lag is of utmost importance to give proper motor and electrical protection and to eliminate needless blowing of fuses.

Remarkable results have been achieved. Interrupting capacity has been greatly increased while the time-current characteristic of FUSETRON fuses has in no way been disturbed.

Play Safe – install Fusetron Fuses throughout the entire electrical system!

Think!...

ALL THIS ADDED SAFETY *without changing a panelboard or switch*... *plus* 10 Point Protection of FUSETRON *dual-element* FUSES!

Maximum Safety

With FUSETRON Fuses there is no cascading of interrupting rating — no places where an excessive fault current might cause serious damage. Every FUSETRON fuse has an interrupting rating in excess of 100,000 amperes.

You don't have to worry about selecting chosen spots in which to *pay extra* for "safe" equipment. Wherever a FUSETRON fuse is installed you have safety as sure and dependable as you can buy — no matter what you pay.

No Maintenance Costs

When FUSETRON fuses have once been installed properly you can forget about them. They need no periodic inspections to see if they will operate safely.

Dust, fumes, corrosion or age cannot prevent a FUSETRON fuse from opening safely. There are no hinges, pivots or contacts to stick or slow down the operation of the fuse on short-circuit.

With FUSETRON fuses — you get safety — without one cent spent for inspection or maintenance costs.

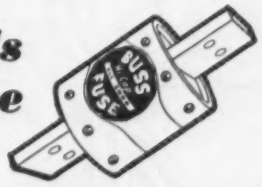
No Recalibration Costs

When a FUSETRON fuse does blow, there is no recalibration needed. As quickly as the fault in the circuit is corrected, you slip in a new fuse that has been CALIBRATED AT THE FACTORY BY ENGINEERS— a fuse that is as safe and dependable as the one that blew.

PLUS 10 POINT Protection with FUSETRON dual-element FUSES

1 Protect against short-circuits. **2** Protect against needless blows caused by harmless overloads. **3** Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation. **4** Provide thermal protection — for panels and switches against damage from heating due to poor contact. **5** Protect motors against burnout from overloading. **6** Protect motors against burnout due to single phasing. **7** Give DOUBLE burnout protection to large motors — without extra cost. **8** Make protection of small motors simple and inexpensive. **9** Protect against waste of space and money — permit use of proper size switches and panels. **10** Protect coils, transformers and solenoids against burnout.

for SAFE PROTECTION on loads above 600 and up to 5000 Ampere install BUSS Hi-Cap FUSES



Tests have shown that BUSS Hi-Cap fuses have unlimited interrupting capacity on circuits of 600 volts or less.

They are designed to give protection against dangerous overloads as well as high fault currents — yet their speed of operation on heavy shorts limits currents to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.

When coordinated properly with FUSETRON dual-element fuses they will not open ahead of the fuses nearest to the fault. Thus trouble is isolated to the part of the circuit in which the fault occurs.

Added SAFETY on Old Installations

On installations where the increase in the capacity of the circuit has outgrown the interrupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of a bad fault.

ACTION THAT SAVES YOU MONEY

By passing the word along that all purchase and stock records should call for FUSETRON fuses on loads up to 600 amps—and BUSS Hi-Cap fuses on loads above that — you get action that begets money saving.

For blowing time charts or more information on FUSETRON Fuses and BUSS Hi-Cap Fuses write for Bulletins FIS and HCS.

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. Division McGraw Electric Company

Here's why the Ljungstrom saves fuel...improves boiler performance

1. Saves Fuel — Savings are roughly 1% for every 45-50°F of preheat, since this heat has been recovered in usable form from flue gases.

2. Increases Boiler Output — Preheating combustion air increases boiler furnace temperature. Heat absorption into boiler tubes increases at the same time, raising the unit's capacity to produce steam.

3. Increases Boiler Reliability — Preheating leads to more complete combustion of fuel; therefore, less slagging. By burning fuel more completely, it helps boilers stay on the line longer. Furthermore, gases to dust recovery units are cleaner.

4. Permits Use of Lower Grade Fuels — Saw and paper mill refuse, wood, lignites, peat, bagasse and similar low-grade fuels become commercially practical when preheated combustion air is used.

The Ljungstrom® Air Preheater . . . used in seven out of ten large boiler installations—is the most compact, reliable and versatile preheater available. Installed in a boiler, it leads to the four well-known advantages listed at the left.

Remember: the ability to deliver these important benefits in full measure is an important reason why more than twice as many Ljungstrom Air Preheaters are specified for large boilers than all other types combined.

WHEREVER YOU BURN FUEL, YOU NEED LJUNGSTROM

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

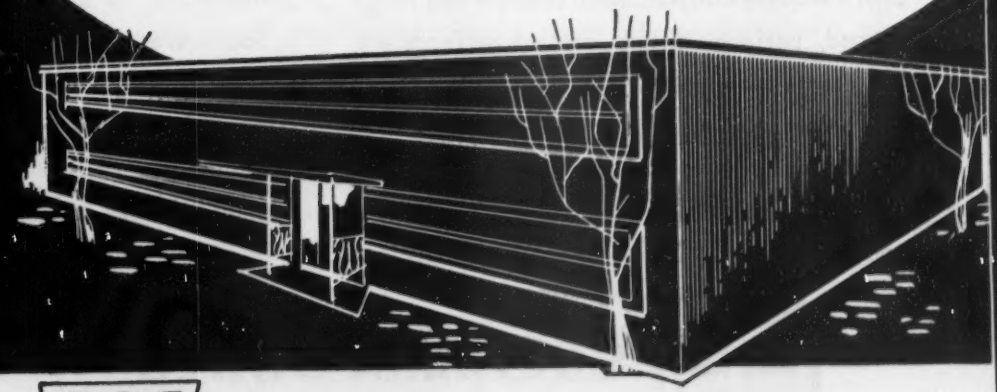
Wheeler Lighting Installation for Daelcam Corp., Boston, Mass. Lockwood Greene Engineers, Inc.

Wheeler

LIGHTING FIXTURES

A BASIC PRODUCTION TOOL OF AMERICA'S LEADING INDUSTRIES!

Where good lighting is a "must," you'll find Wheeler on the job! In industry after industry . . where modern progressive thinking rules . . Wheeler Lighting Fixtures are the logical choice for maximum lighting efficiency!



Wheeler WHEELER **REFLECTOR COMPANY**

275 CONGRESS STREET, BOSTON 10, MASS.

Lighting Equipment Specialists Since 1881

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

DESIGNED FOR YOUR APPLICATIONS

Rugged construction at pressure points, more than adequate cross-sectional strength and rough ground, perfectly fitting contact surfaces are key design features that enable Southern States connectors and bus supports to perform as dependable links in your power equipment chain.

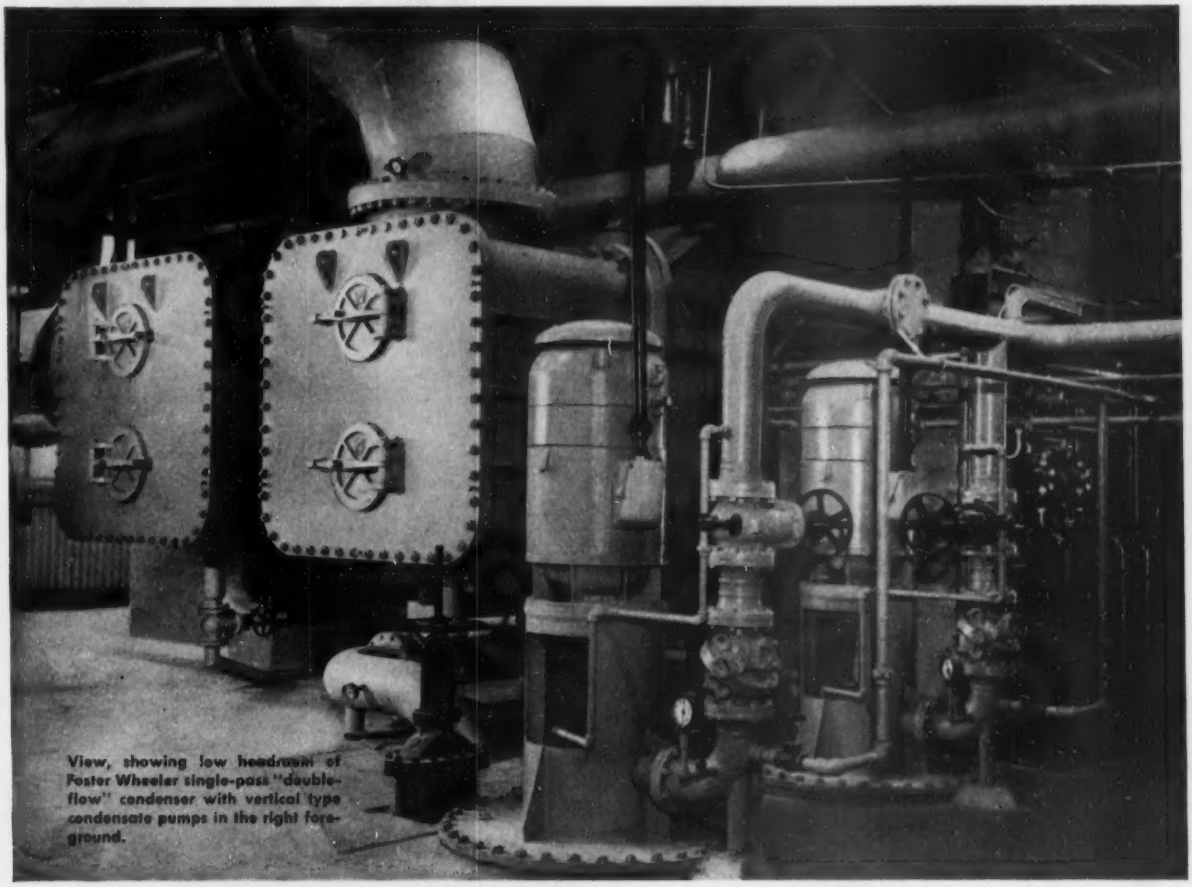
The wide range of types and sizes in connectors and bus supports for all types of conductors simplifies your choice of the right Southern States fitting for normal application.*

Southern States' 160 page Connector and Bus Support catalog lists and illustrates all fittings. It is indexed and cross-indexed for quick reference. Write for your copy on your letterhead.

**Special designs can be supplied to meet specific requirements.*

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

SHORTER on headroom - LONGER on savings



View, showing low headroom of Foster Wheeler single-pass "double-flow" condenser with vertical type condensate pumps in the right foreground.

New Foster Wheeler "double-flow" condenser uses 40% less headroom – cuts building costs – more than meets the highest performance standards

Utilizing a volume only 60% of that customarily required, the new Foster Wheeler "double-flow" principle marks a new advance in condenser design. Less headroom is required—often 40% less than the over-all height of conventional units. This means a proportionately shorter turbine pedestal—and a substantial reduction in building costs.

The rectangular shape makes possible complete utilization of the space available. Intimate contact and scrubbing action between steam and condensate promote effective deaeration and reheating. Condensate leaves the hotwell at steam temperature under all operating conditions. Also, because of the larger steam entrance and shorter tube-bank depth, pressure loss is reduced to a minimum. Efficient cooling of the non-condensate vapors and gases is provided by triangular cooler sections of the series zone type.

In a typical test of a 32,500 sq. ft. unit, the actual heat transfer coefficient showed 578 Btu per hr. per sq. ft. per F as against 510 for commercially clean tubes,—thus resulting in an absolute pressure 0.10 inch better than expected. Further details on request.

FOSTER WHEELER CORPORATION
165 Broadway, New York 6, N. Y.

FOSTER WHEELER

CORONA *free* DESIGN

Stretches

HERE'S A TRANSFORMER THAT WILL STAY YOUNG

CORONA AGES TRANSFORMERS prematurely, produces local heat and chars insulation. Eventually insulation becomes a conductor, causing transformer failure.

Corona-free design of Allis-Chalmers power transformers means that corona will never cut into this transformer's life. The harmful effect of corona will never reduce return from this transformer investment.

Economical FORCED OIL COOLING

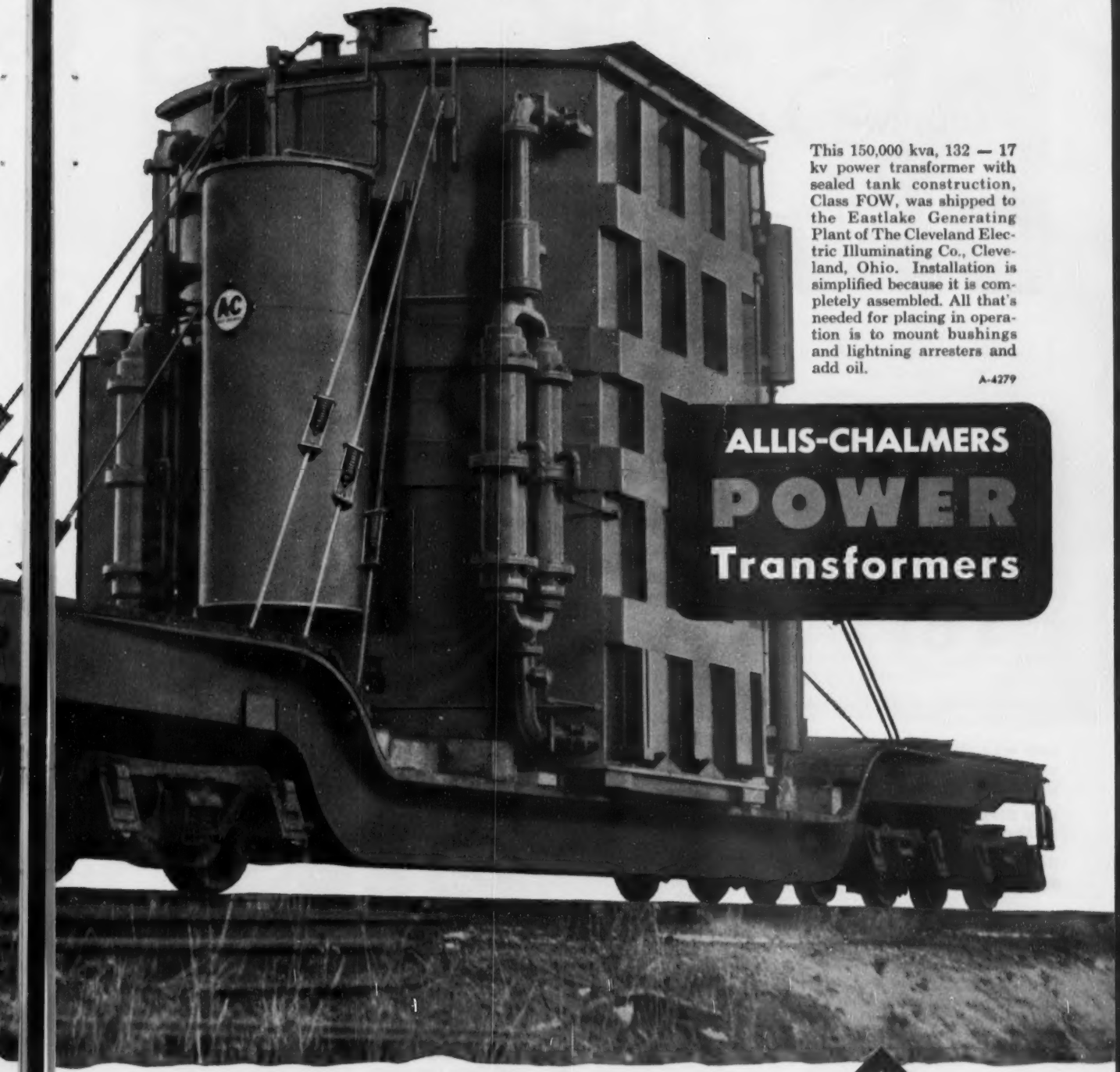
In this transformer, two *Electro-Cooler* units (visible on left side of transformer) remove warm oil from the top of the transformer tank, circulate it through water-cooled heat exchangers, and return it to the lower portion of the tank. Forced oil cooling of power transformers was first made economical by Allis-Chalmers development of the *Electro-Cooler*.

The *Electro-Cooler* is an entirely self-contained, self-supporting, and self-lubricated oil-immersed motor and pump on a single shaft. It is totally enclosed in a single casing and sealed. Two ball bearings support both pump and motor. There are no glands, stuffing boxes, or oil leaks. The three-phase squirrel-cage motor has no starting brushes, no commutator, or other wearing parts.

Electro-Cooler is an Allis-Chalmers trademark.

ALLIS-

Investment Dollars



This 150,000 kva, 132 — 17 kv power transformer with sealed tank construction, Class FOW, was shipped to the Eastlake Generating Plant of The Cleveland Electric Illuminating Co., Cleveland, Ohio. Installation is simplified because it is completely assembled. All that's needed for placing in operation is to mount bushings and lightning arresters and add oil.

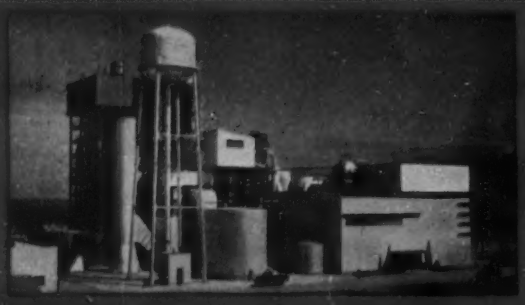
A-4279

ALLIS-CHALMERS
POWER
Transformers

CHALMERS

A-C ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN



SOUTHWESTERN PUBLIC SERVICE CO.—*another user of*

Exide-Manchex BATTERIES

In the wide open spaces of Lamb County, Texas, lies Plant X, newest of Southwestern Public Service Company's power plants, and one of 11 with which the company provides dependable electric service for its Tri-state area.

Throughout America, more and more power stations are using Exide-Manchex batteries. They assure:

POSITIVE OPERATION: Dependable performance at ample voltage avoids switchgear operational failures.

INSTANTANEOUS POWER: High rates for switchgear and valve operation with adequate reserve power for all other control circuits and for emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding.

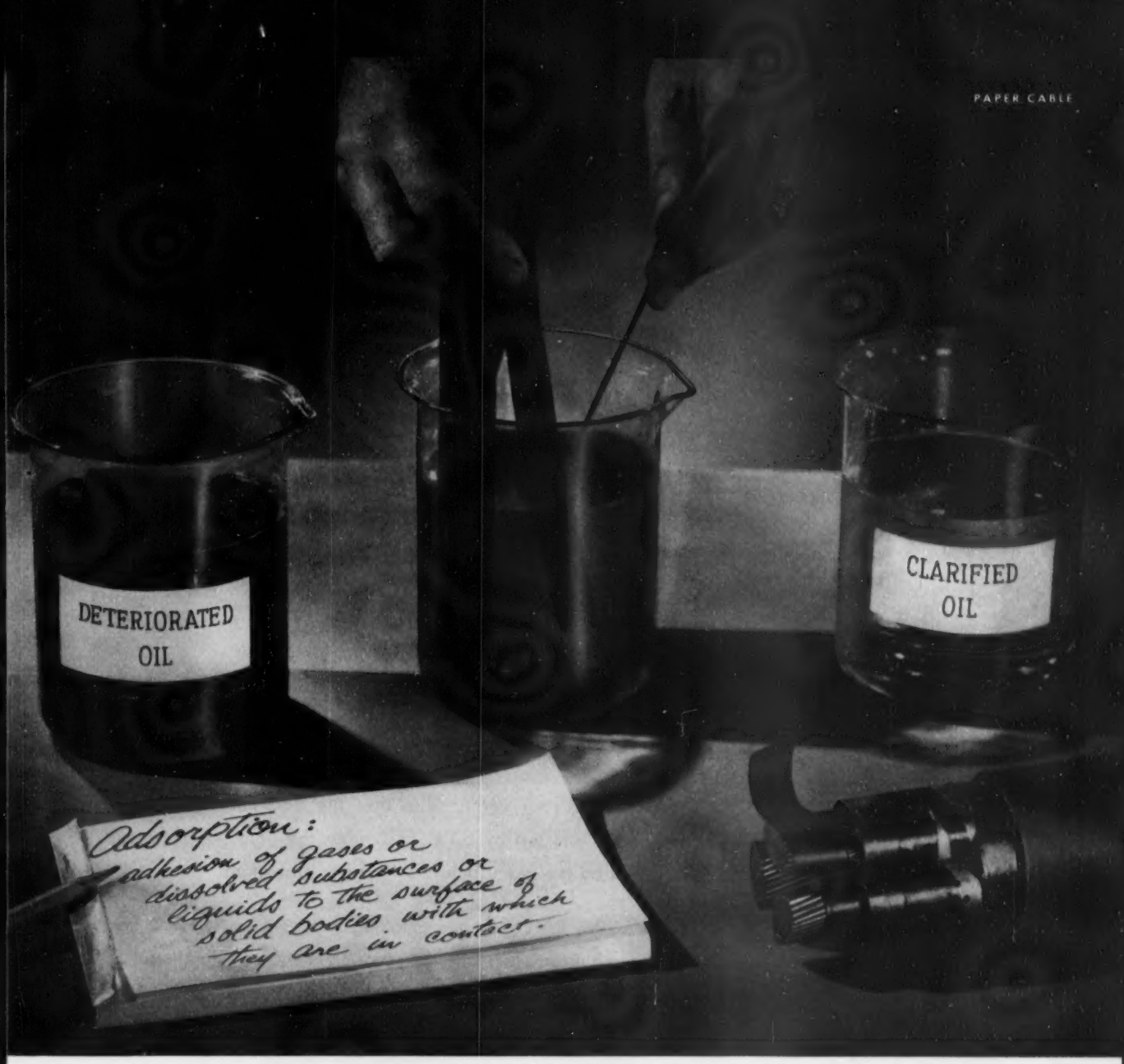
• • •

Various sizes and types of Exide Batteries are available in plastic containers.

Exide-Manchex is your best battery buy for all control and substation service.

Installation showing one of two 60-cell EME-17 Exide-Manchex control batteries in the Lamb County power plant.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.


DETERIORATED OIL
CLARIFIED OIL
Adsorption:
adhesion of gases or dissolved substances or liquids to the surface of solid bodies with which they are in contact.

EXPERIMENT in adsorption: add tapes made with colloidal carbon to deteriorated oil; stir. Note that Carbon Black *adsorbs* impurities. Clear oil results. In Type CB Cable these carbon-black tapes purify oil by the same process.

"Black Magic" makes this cable last longer

Heat and electrical stress . . . heat and electrical stress . . . keep it up long enough and insulating oil in ordinary paper cable breaks down. The cable may have to be replaced.

ANACONDA Type CB* (Carbon Black) Power Cable is different. Special carbon-black tapes continually purify and stabilize the insulating oil . . . keep oxidation products outside the dielectric field. They stop ionization discharges. "Black magic" insures added life for this superior cable.

For greatly extended sheath life of ANACONDA Type CB Cable, specify ANACONDA F-3** alloy. This superior alloy-lead sheath won't age-harden . . . resists slow-bending fatigue, creep, burst and abrasion. Cable joint sleeves also are available in this same alloy. They all offer higher tensile strength, a 50% higher bursting strength than copper-lead, lower creep rate and similar increased resistance to bending fatigue and vibration.

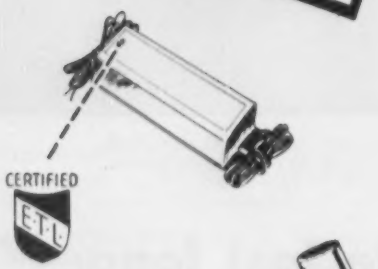
Ask your Anaconda Representative to show you how this outstanding cable can help give your distribution system maximum service life and economy. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*CB — Carbon Black (U. S. Patents 2,102,129, 2,405,853) Reg. U. S. Pat. Off.
**F-3—Arsenic-Lead Alloy (U. S. Patents 2,300,788, 2,375,755, 2,504,600 and 2,570,501) Reg. U. S. Pat. Off.

ANACONDA®

Service and overhead distribution cables, bare and weatherproof, including ACSR • signal, control and communication cable • portable cords and cables • network cables • airport and series lighting cables • mine cables • magnet wire • copper, aluminum and copperweld conductors • wire and cable accessories.

TO GET YOUR MONEY'S WORTH WHEN YOU BUY LIGHTING EQUIPMENT...



...Look for the Label

The label is your certification that the equipment has been continuously tested by E.T.L. and meets the rigid specifications adapted by the manufacturers for your protection.

Since 1896, E.T.L. has been making impartial tests. E.T.L. has served manufacturers and users of light-sources, lighting fixtures, auxiliary equipment, portable lamps, and other electrical products.

Today, the scope of E.T.L. services has widened to include not only electrical, electronic and photometric testing, but physical and chemical as well. Besides testing, it also includes inspection, standardization and calibration, and certification.

These services are available to you. A competent staff of engineers and technicians with exceptional test equipment, housed in the E.T.L. owned and operated 8-story building with more than 3 acres of floor space, is at your service. Booklet on request.

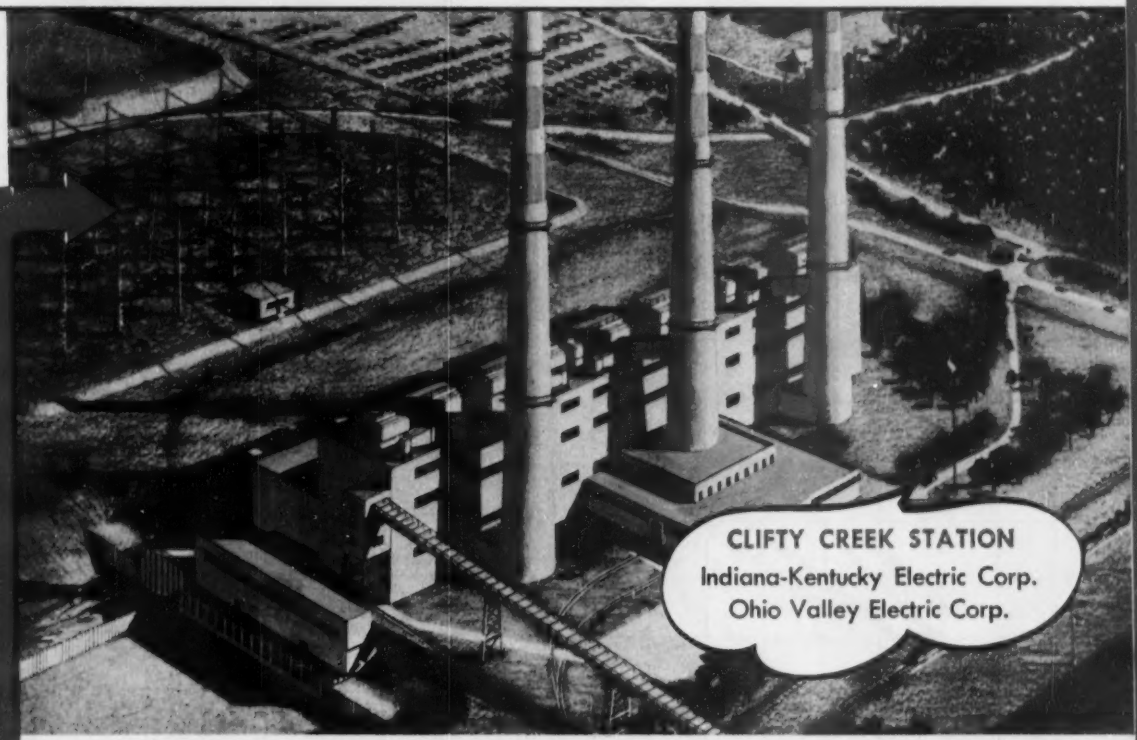
Know by ETL *Test*

ELECTRICAL TESTING LABORATORIES, INC.

2 East End Avenue at 79th Street, New York 21, N. Y.

ELECTRICAL • PHYSICAL • CHEMICAL • TESTING • INSPECTION • CERTIFICATION

"Largest ever built by private enterprise"



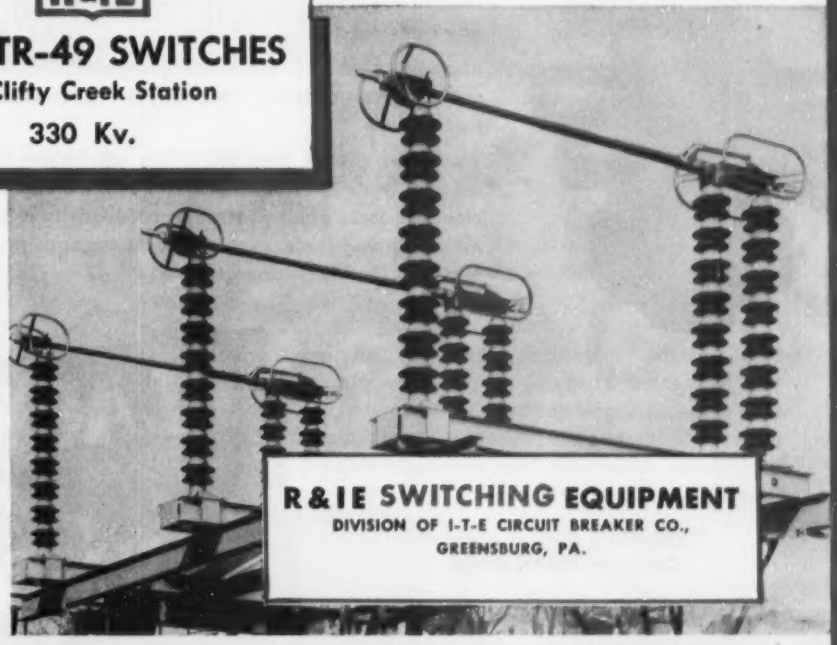
Clifty Creek plant as it will look when completed. This plant, located near Madison, Ind., will be the largest ever built by private enterprise when it is completed in 1956. It will have total generating capability of 1,200,000 kilowatts in its six 200,000-kw units. Ground was broken in December 1952, structural steel erection was started February 1954 and power production is scheduled to begin early next year, when unit 1 is completed. Indiana-Kentucky Electric Corp., a subsidiary of Ohio Valley Electric Corp., is constructing the plant. It is one of two being built to supply the tremendous power requirements of the AEC's new Portsmouth Area Project in Pike County, Ohio.

R&IE

Type TTR-49 SWITCHES

for Clifty Creek Station

330 Kv.



Here is a three pole assembly—showing eight high stack for 380 Kv nominal voltage, 1470 impulse. Corona free at 275 Kv to ground, with less than 500 microvolts radio influence. Easily operated with 30 pounds effort on 12 inch geared handle. Impact-free blade control in opening and closing.

R&IE booklet "Growth of an Idea" offers interesting information about this division of I-T-E Circuit Breaker Co. and its products.

R&IE SWITCHING EQUIPMENT
DIVISION OF I-T-E CIRCUIT BREAKER CO.,
GREENSBURG, PA.

Highest U. S. Voltage to date for Power Transmission

STRUCTURES—steel or aluminum ● TESTING DEVICES ● KIRK KEY INTERLOCK SYSTEMS ● ISOLATED PHASE BUS STRUCTURES ● INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION ● OUTDOOR BUS SUPPORTS and AIR SWITCHES ● SUBSTATION

25% More CLAMPING FORCE!

Amazing CFC* Process Sets Impressive New Standards for Connector Performance

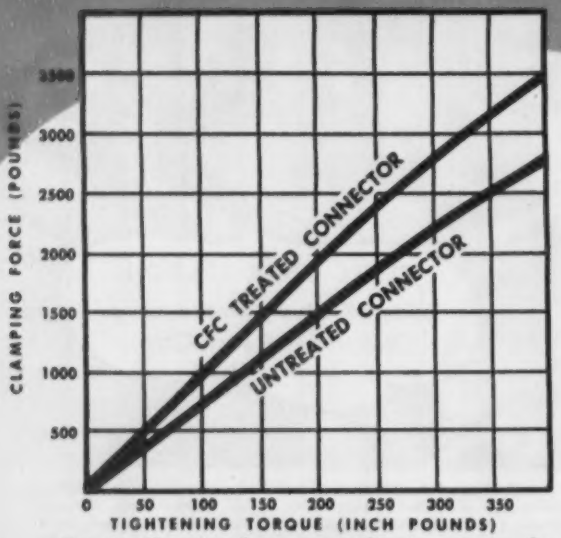


Fig. 1: *Clamping force vs. tightening torque for No. 2 stranded connectors, comparing CFC treated connectors with untreated connectors of the same lot.*

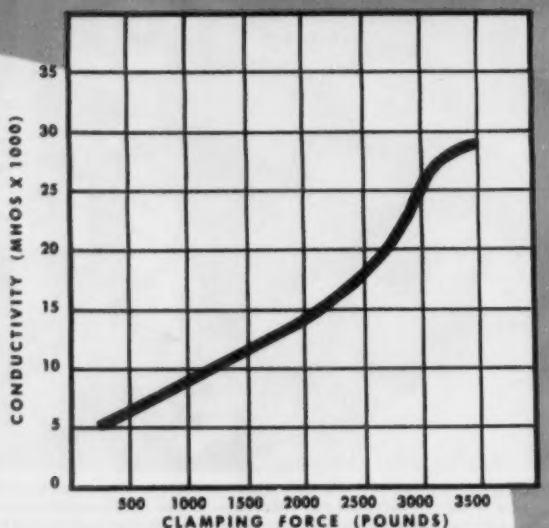


Fig. 2: *Conductivity vs. clamping force for No. 2 stranded hard drawn conductors.*

BLACKBURN'S exclusive chemical process for copper alloy connectors drastically reduces thread friction — increases clamping force — produces lower-resistance connections — and insures lasting, trouble-free service.

The above graphs show the great advantages of CFC treated Connectors. Note over 25% increase in clamping force. Note also how clamping force greatly increases conductivity of the connection. Thus, high clamping force, plus connector strength to **maintain** this force, gives you the **ideal** connection.

BLACKBURN Hi-Strength Connectors give you this **extra** clamping force — give you the **extra** strength to **hold** a maximum-pressure connection . . . Result — absolutely dependable connections that stay tight and trouble-free year after year.

BLACKBURN *Hi-Strength* **CONNECTORS**

**Chemical Friction Control Process — Patent pending*

JASPER BLACKBURN CORP.
35 MADISON ST., ST. LOUIS 6, MO.
Phone MA. 1-2821

STRONGER THAN THE PIN

In laboratory tests to determine the torsion strength of Kimble *Tempered* Glass Insulators, wood pins were sheared off, and lead-bushed threads stripped, with no failure of the Insulators. Cantilever tests using special alloy pins were discontinued at 10,000 lbs. with still no failure. Ultimate impact tests averaged 130 inch pounds!

Kimble *Tempered* Glass Insulators save installation time because it's never necessary to loosen for lineup with the conductor. Their great strength always allows another quarter-turn.

If it's on the pin, it's in service

Tests far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air. Even lightning surges have failed to damage them. In the event of shattering due to severe mechanical shock, insulator disintegrates into small, non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

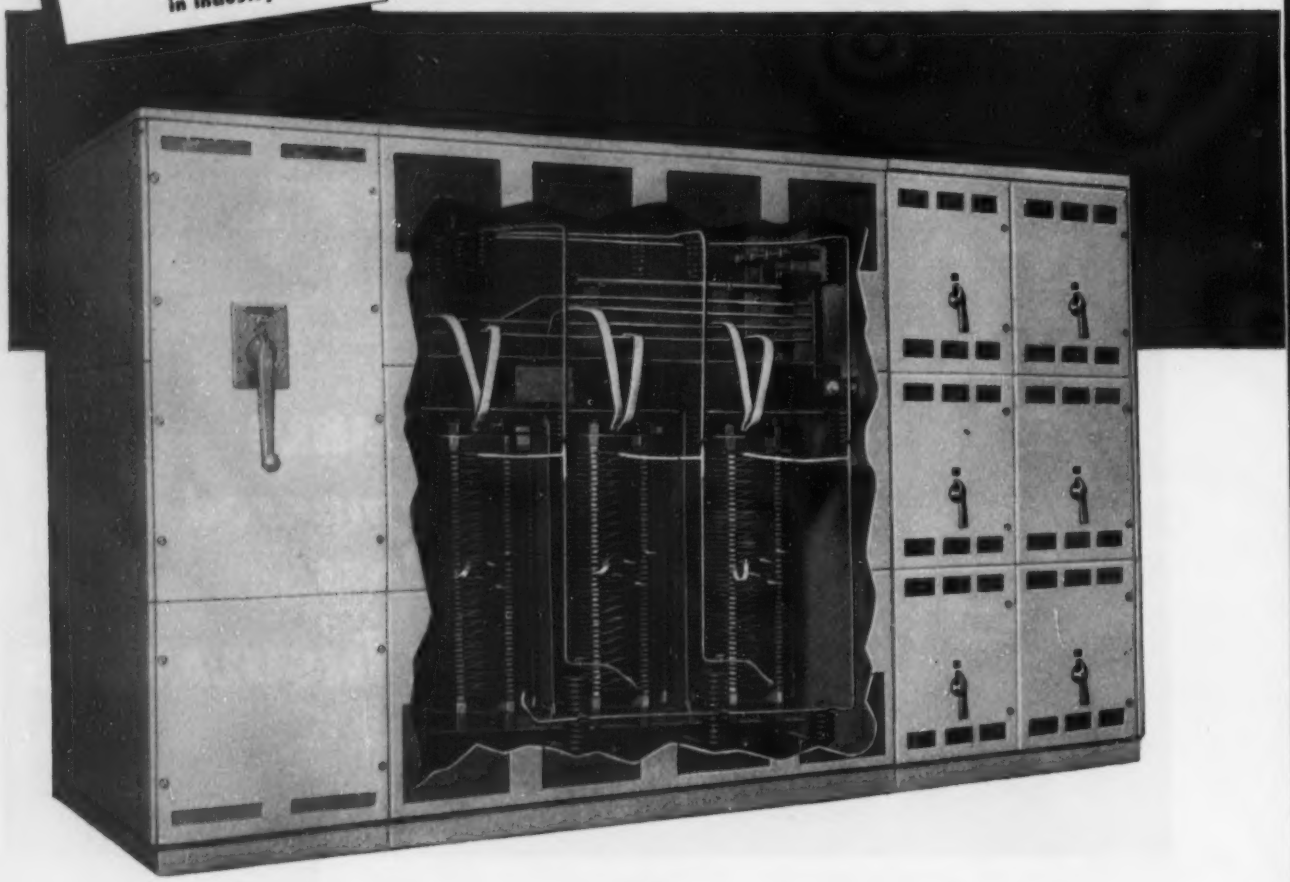
Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dpt. EW-8. Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

Wagner®
TRANSFORMERS
...the choice of leaders
in industry

for a reliable load-center



The importance of the transformers in your plant power distribution system cannot be overemphasized. If a switch or a circuit breaker fails, only a part of the system is usually affected—but if the *transformer* fails, the entire system is dead. When you specify Wagner, you can be sure of a dependable, continuous flow of power.

Wagner manufactures both dry type and liquid-filled Unit Substation Transformers, in ratings through 2000 kva, 15 kv and below—you can choose a type and rating exactly *right* for your requirements.

Bulletins TU-56 and TU-13 give full information. Write for your copies today.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

TS4-9

power supply---*always specify...*

Wagner

PREDESIGNED Dry Type Transformers

you gain because:

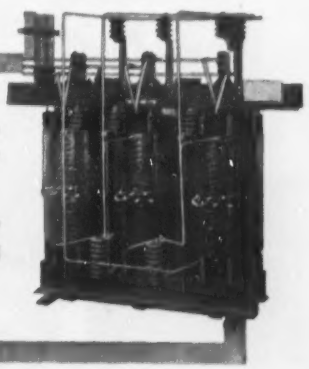
- **you save shipment time**
- **you save job engineering costs**
- **you get full Wagner Quality with switchgear of your choice**

Wagner "Predesigned" Dry Type Substation Transformers are carefully engineered to meet heavy industrial demands. Predesigning completely eliminates individual job engineering... reduces your costs... and saves shipment time.

Wagner "Predesigned" Dry Type Transformers consist of standardized core and coils rated from 112.5 to 2000 kva. All Unit Substation builders have the information and coordination necessary to use these transformers with switchgear of your choice.

You can specify the Wagner Transformer that exactly meets your load-center distribution requirements—be assured of full Wagner Transformer Quality—and gain a substantial advantage in delivery time and in cost.

Investigate the many advantages of specifying Wagner "Predesigned" Dry Type Unit Substation Transformers for your next load-center installation. Consult the nearest of our 32 branch offices, or write direct to us.



Wagner "Predesigned" Dry Type Unit Substation Transformers are for indoor installation. Because of their relatively light weight, they can be used in multi-story buildings.

These transformers are not designed for minimum duty only—they have all the Wagner quality necessary to meet heavy industrial demands. You can depend on Wagner for quality.

WITH A KIDDE CO_2 SYSTEM!

Let fire get a foothold, and a going concern is *gone*. Don't risk it. Install a Kidde Automatic CO_2 Fire Extinguishing System, and fire won't stand a chance.

A Kidde System goes into action at the first sign of fire—releases clouds of CO_2 over the blaze, smothers fire almost as soon as it starts. And CO_2 leaves no mess to clean up later. It puts out the fire, then vanishes.

Protect motors, generators, switch gear—all electrical equipment with a Kidde System.

And for on-the-spot protection, get Kidde portables. When fire strikes, just aim the horn, pull the trigger, and *swoosh!* No more fire.

Don't wait 'til your business is a cinder pile—Contact Kidde today.

Kidde

The words 'Kidde', 'Lux', 'Lux-O-Matic' 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

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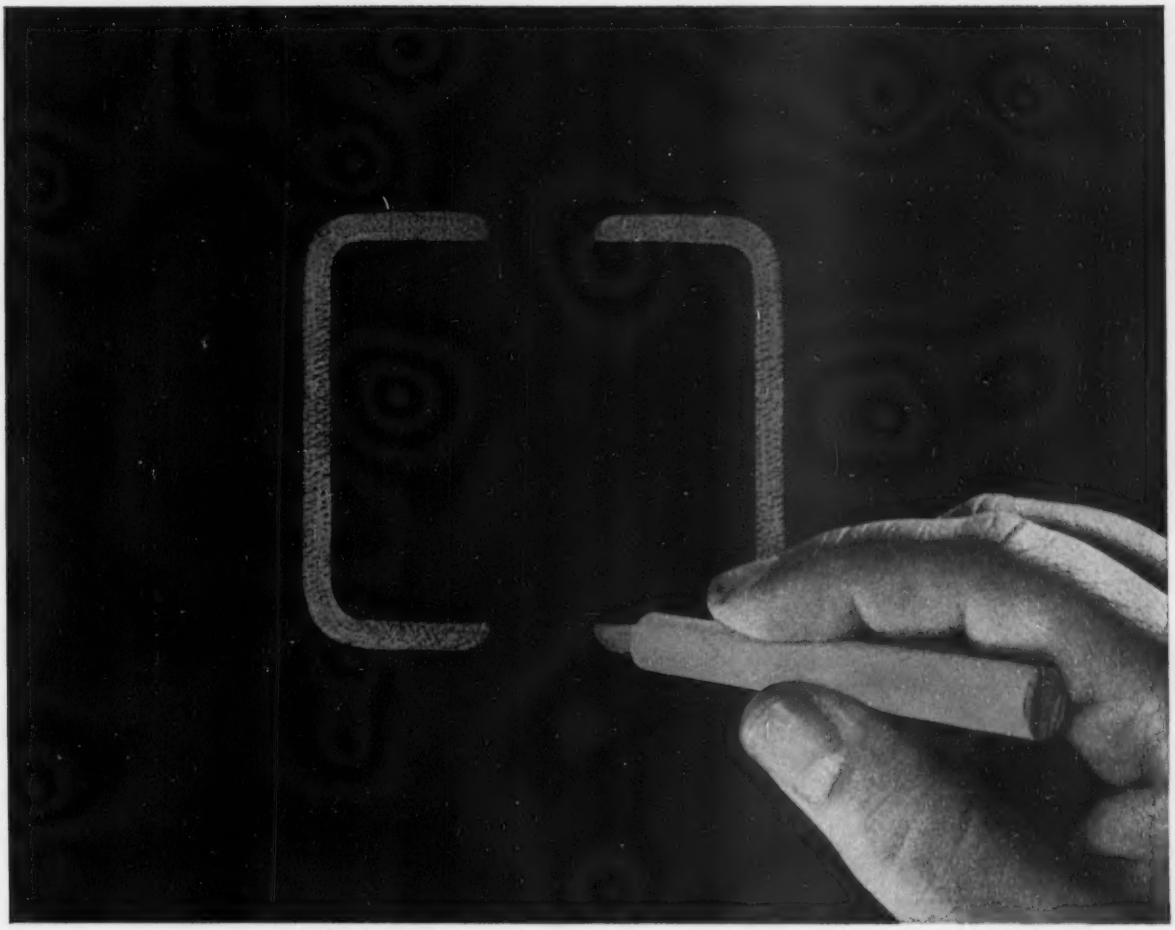


THE ADVANTAGES OF

CHANNEL SQUARE

BUS CONDUCTORS

A bus conductor constructed of two copper channels with longitudinal ventilating slots, one above the other, has these mechanical and electrical advantages:

It is a hollow conductor of great structural strength.

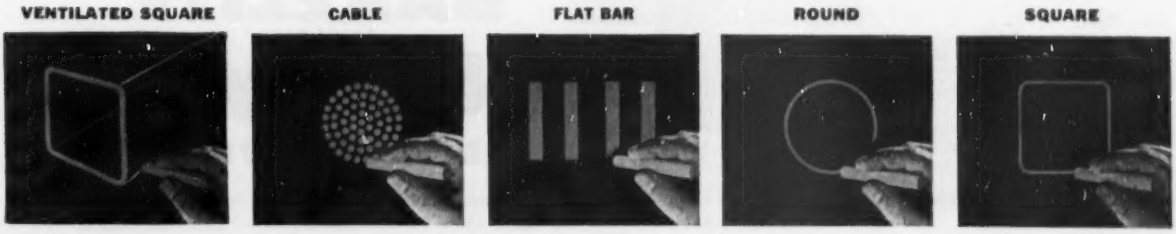
It has good current distribution at normal power frequencies.

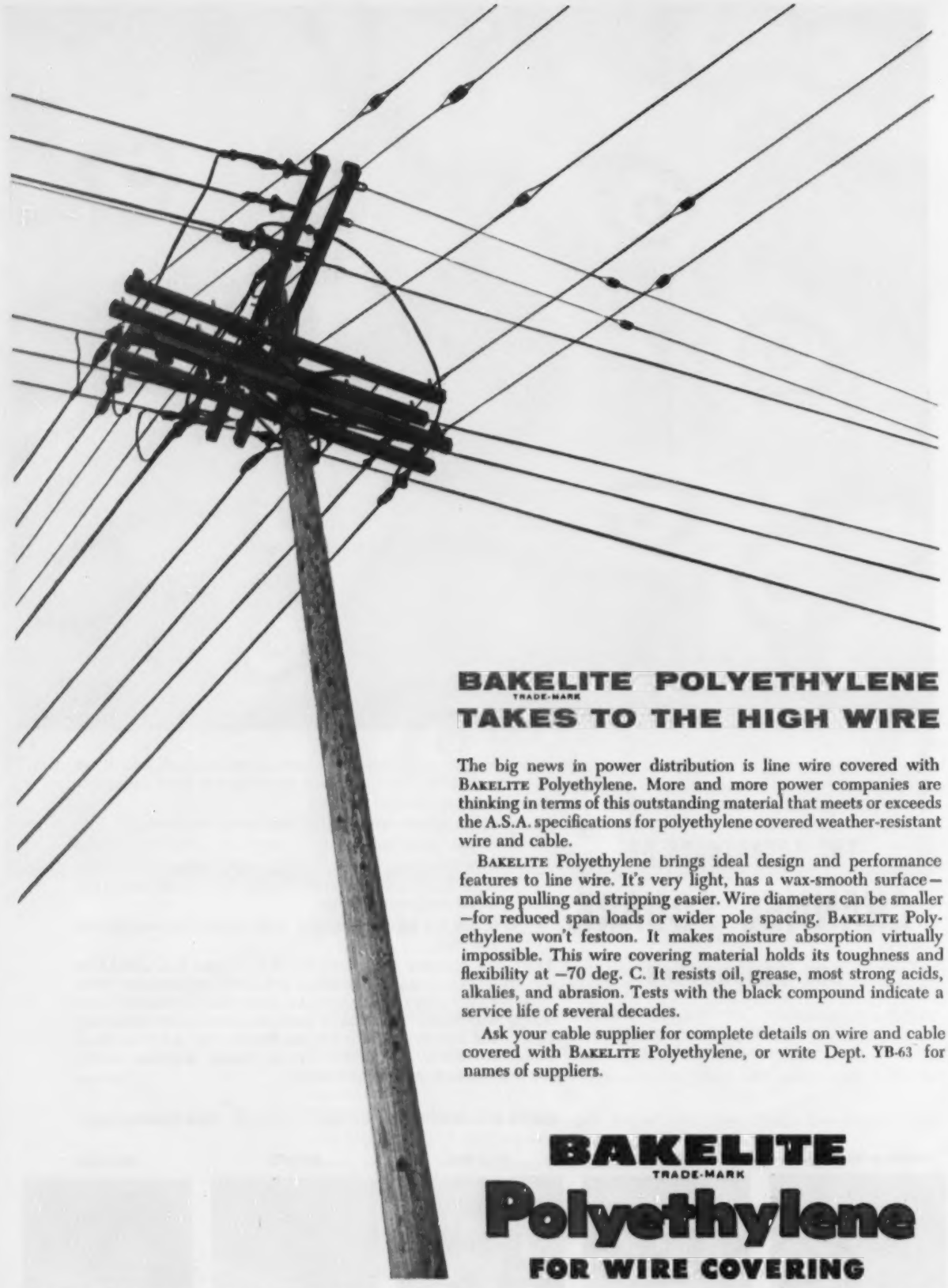
It has large surface areas and unimpeded internal ventilation to aid dissipation of heat.

It has flat surfaces on four sides simplifying connections and taps.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information concerning designs and arrangements for bus conductors. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 55180 Rev.

carry the load with ANACONDA® Bus Conductors





BAKELITE TRADE-MARK POLYETHYLENE TAKES TO THE HIGH WIRE

The big news in power distribution is line wire covered with BAKELITE Polyethylene. More and more power companies are thinking in terms of this outstanding material that meets or exceeds the A.S.A. specifications for polyethylene covered weather-resistant wire and cable.

BAKELITE Polyethylene brings ideal design and performance features to line wire. It's very light, has a wax-smooth surface—making pulling and stripping easier. Wire diameters can be smaller—for reduced span loads or wider pole spacing. BAKELITE Polyethylene won't festoon. It makes moisture absorption virtually impossible. This wire covering material holds its toughness and flexibility at —70 deg. C. It resists oil, grease, most strong acids, alkalies, and abrasion. Tests with the black compound indicate a service life of several decades.

Ask your cable supplier for complete details on wire and cable covered with BAKELITE Polyethylene, or write Dept. YB-63 for names of suppliers.

BAKELITE TRADE-MARK
Polyethylene
FOR WIRE COVERING

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

SHE WON'T TAKE NO FOR AN ANSWER

When the American housewife wants more electric power, she won't take no for an answer. Neither will industry in producing more and better products for every need.

That's why America's power companies, today doing the tremendous job of supplying an all-time peak demand, are at the same time planning . . . and building . . . for the still greater capacity that will be needed tomorrow.

Many utility companies have found that Ebasco can help them determine whether additional facilities are needed—where, what and when to build. Ebasco's specialized services to the electric power industry encompass every aspect of expansion—from studies of present and potential markets, long-range system planning, financing—right up through the actual design and construction of any type of new plant or station.

In its half-century of service to business and industry, Ebasco has served more than 145 electric companies covering every phase of operations. Our booklet, "The Inside Story of Outside Help," blueprints the value of this experience to your company. We will be glad to send you a copy. Write Ebasco Services Inc., Dept. M, Two Rector Street, New York 6, N. Y.

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FORECAST: Electrical Utilities to Increase

Phelps Dodge will help you meet your Expanding Power Cable Needs!

PRACTICAL EXPERIENCE IN RESEARCH, COMPLETE RANGE OF HIGH

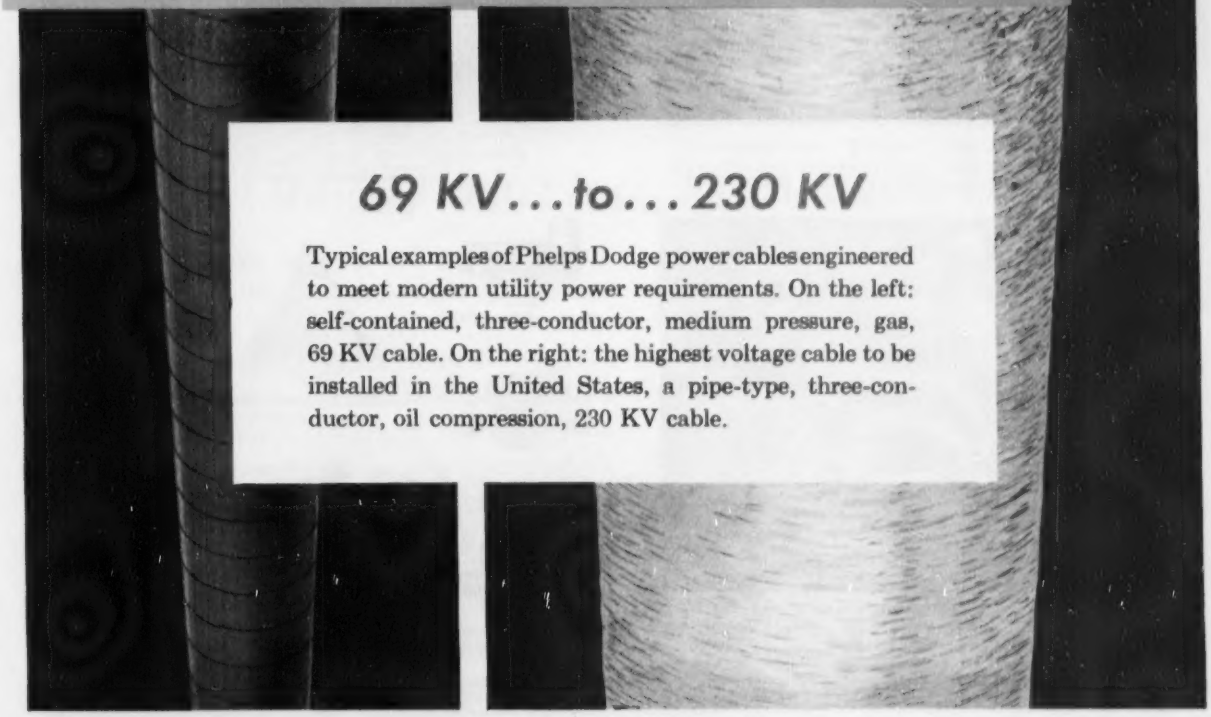
THE electric utility industry will increase its generating capacity by 13 million KWH in 1954.* Phelps Dodge is meeting this constant high-voltage power cable expansion program with research, design, and manufacturing know-how. Year after year, Phelps Dodge has met utility demands for cables with higher voltage ratings and greater carrying capacities. Phelps Dodge's experience, research facilities and engineering skill are the answer to your cable requirements regardless of voltage or type.

**Electrical World*

PHELPS DODGE COPPER PRODUCTS CORPORATION

Generating Capacity 13 Million KWH in 1954

DESIGN AND MANUFACTURE OF A VOLTAGE POWER CABLES!



69 KV...to...230 KV

Typical examples of Phelps Dodge power cables engineered to meet modern utility power requirements. On the left: self-contained, three-conductor, medium pressure, gas, 69 KV cable. On the right: the highest voltage cable to be installed in the United States, a pipe-type, three-conductor, oil compression, 230 KV cable.

CROUSE-HINDS rigid quality control *assures long-lasting products ...* CONDULET* records prove it!

Making a tensile strength test of a Feraloy bar in the Mechanical Laboratory. Constant testing insures uniform quality.

A hydrostatic test of a Type EPC explosion-proof Condulet. It must withstand a pressure 4 times as great as an internal explosion.

Guaging the threads of an Obround Condulet in the factory. Crouse-Hinds quality control follows through to the finished product.

The first CONDULETS, introduced by Crouse-Hinds in 1905, were so well designed and so carefully manufactured that many of the early installations are still in use.... still giving dependable service after more than forty years. This record proves that where quality counts, you can count on CONDULETS!

Crouse-Hinds high standard of quality has always been controlled by careful checking and testing of both raw materials and the finished product. The CONDULET line has expanded from a few items to more than 15,000 types and sizes and the testing laboratories have kept pace with this development. They contain the latest and most modern testing equipment.

Laboratory testing is only part of Crouse-Hinds system of rigid quality control. Factory inspection is equally important. Together, they assure a superior product that will serve you better . . . and last longer!

Always specify CONDULETS.

***CONDULETS are made only by CROUSE-HINDS**

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

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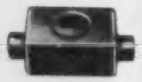
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

Type LB
Obround Condulet

Type EVA Explosion-Proof
Lighting Fixture

Type GUAC Explosion-Proof
Junction Condulet

Type ARE
Plug Receptacle

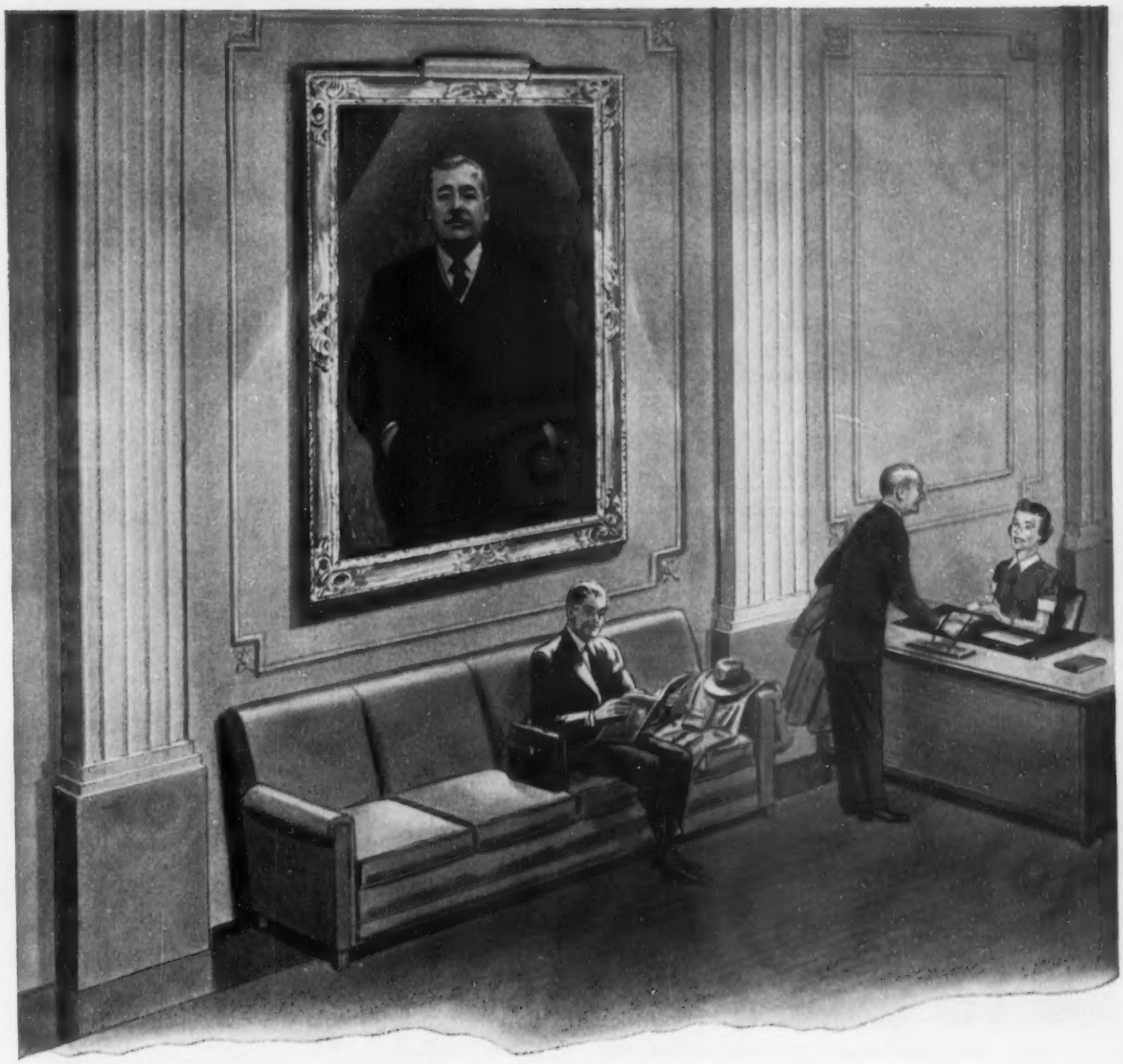


Type FSC Tumbler
Switch Condulet

CONDULET
First in the field
STANDARD OF QUALITY

A Nationwide Distribution Through Electrical Distributors

AIRPORT LIGHTING · FLOODLIGHTS · CONDULETS · TRAFFIC SIGNALS



Colonel Byllesby didn't know he was a pioneer . . . . .

It was before the turn of the century that young Henry Byllesby worked side by side with Tom Edison and George Westinghouse. As they each contributed their great knowledge to design the first steam operated electric central station in the world, the farthest thought from Henry Byllesby's mind was that someday he and Tom and George would be regarded as pioneers in electric power. It was therefore more than coincidence that the company he founded in 1902 should later be aptly named, Pioneer Service and Engineering. This is but a tribute to the vision of a man who, with his company, contributed to making America the most powerful nation on earth. This year Pioneer takes pride in celebrating LIGHT'S DIAMOND JUBILEE and pauses a moment to respect the name of its founder *. . . who didn't know he was to be a pioneer.*

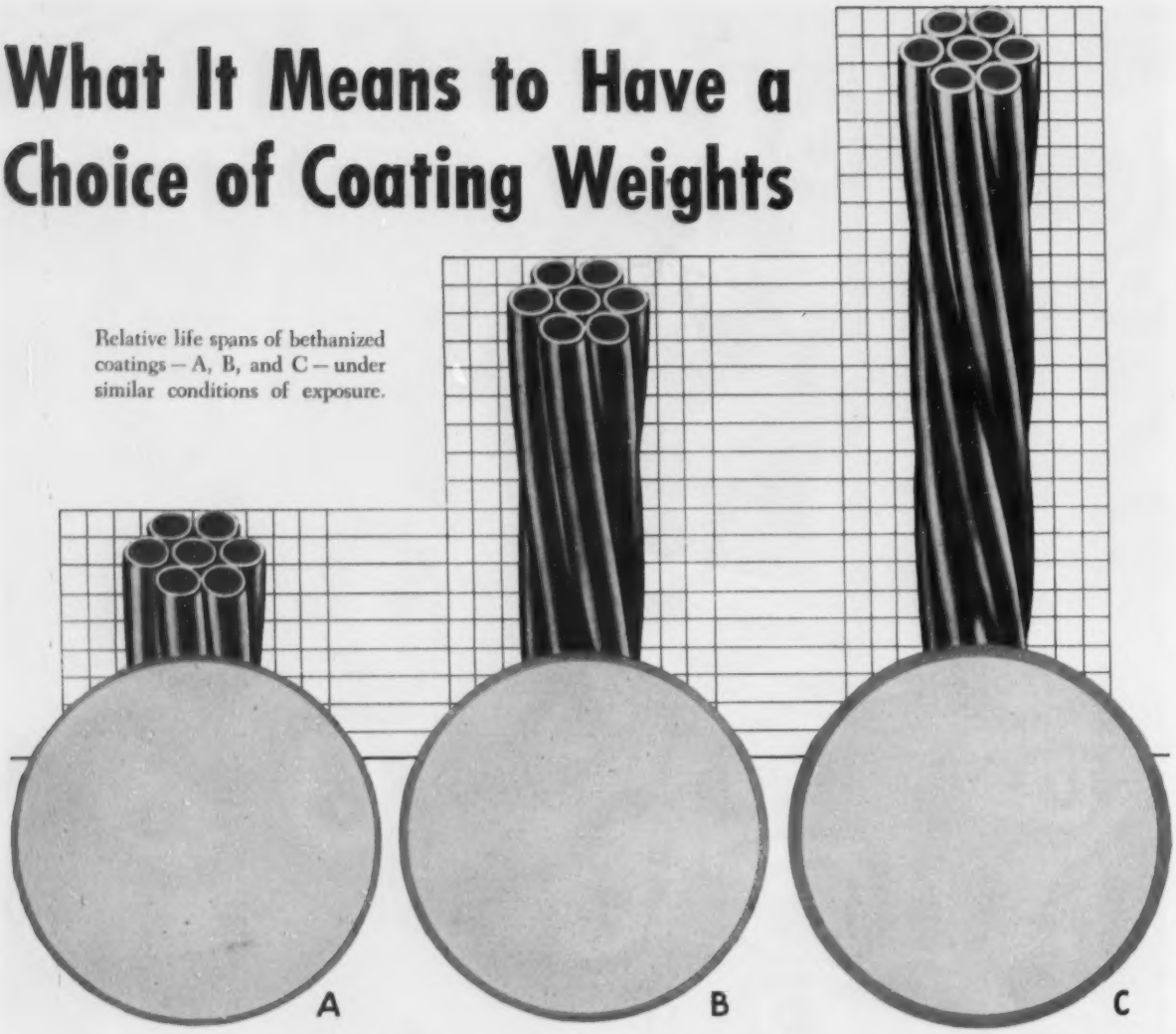
52 YEARS

Serving power plant needs of utilities and private industries

Pioneer Service & Engineering Co. 231 SOUTH LASALLE ST. CHICAGO 4, ILL.

What It Means to Have a Choice of Coating Weights

Relative life spans of bethanized coatings – A, B, and C – under similar conditions of exposure.



For a good many years (fortunately, they're ancient history, now) line designers were limited to an extra-galvanized zinc coating when they specified steel strand. If the strand lasted as long as the line, well and good. If not, it had to be replaced.

That expensive situation was largely corrected when Bethlehem developed its bethanized strand, and made three choices of coatings available. Bethlehem's coating A is equal to extra-galvanized; coating B is twice as thick as A; coating C, three times as thick as A.

In all three cases the *quality* is identical. The only difference is in the weights.

So which coating should you select for your particular installation?

That depends on the life-expectancy of the line as a whole. In many cases, the A-weight is entirely satisfactory; but for the long-term jobs, one of the heavier weights of coating is the logical choice. Being thicker, both B and C will outlast A by years, under similar conditions. Yet these heavier coatings cost *very little more.*

By specifying bethanized strand with the proper coating-weight, you can easily match strand life to line life. It's an economical step, to be considered by every line designer. May we give you full details?

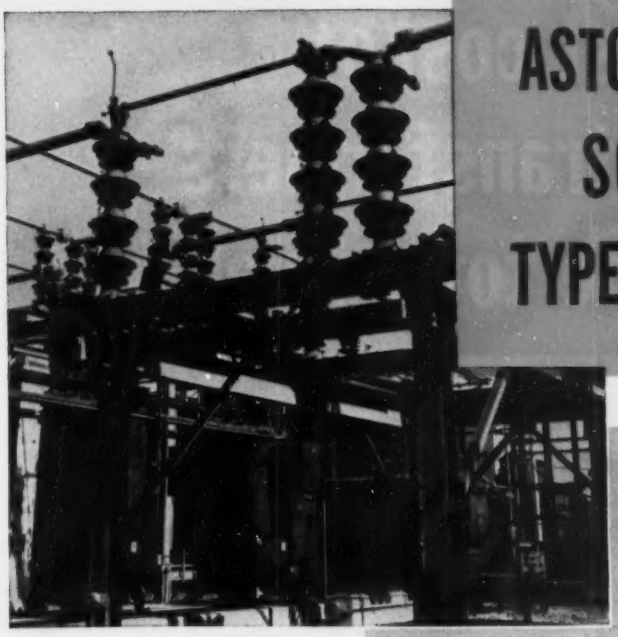
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

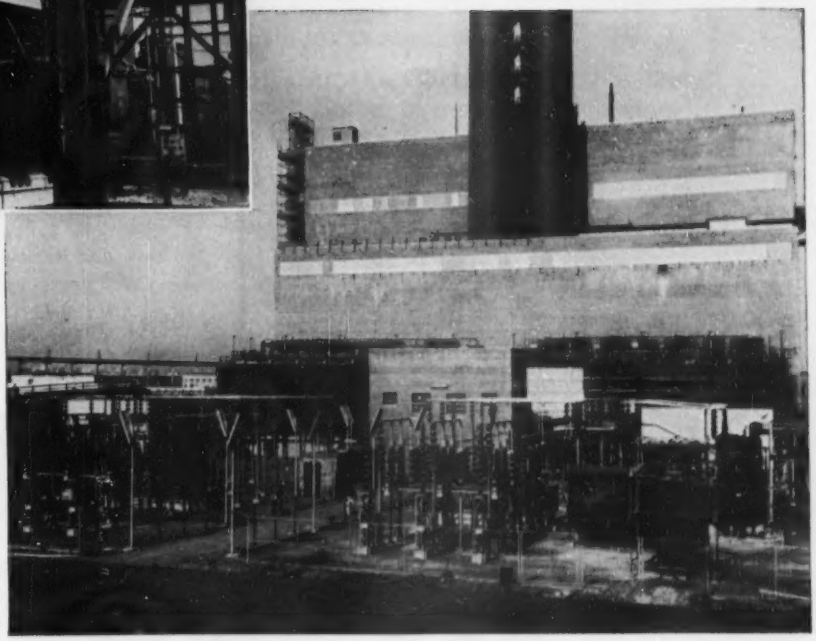
BETHANIZED STRAND

BETHLEHEM STEEL

ASTORIA STATION USES SOUTHERN STATES TYPE WAG SWITCHES



In use at the Astoria Station are Southern States 161 kv, 1200 ampere Type WAG Air Break and G-WAG Grounding Switches, shown here. The Type G-WAG is mounted integrally with the Type WAG on either the jaw or hinge-end stationary insulator stack. Mechanical or electrical interlocks (or both) are supplied to prevent air switch and grounding switch from being closed at the same time.



A section of the Astoria Generating Station of the Consolidated Edison Co. of New York, Inc. The station when ultimately completed, will have a capacity of over a million kilowatts. The newest type of equipment is used in this latest addition to one of the nation's largest electric utilities.

Consolidated Edison Company's new Astoria Station, the last word in steam generating plants, naturally uses equipment that assures maximum protection against mechanical or electrical failure. Dependable service to its 2,800,000 meters has long been a must for one of the Nation's largest electric utilities. No chance can be taken with this vital load. So it was only natural that Southern States Type WAG Air Break and Grounding Switches were chosen for the Astoria Station.

The superior features of Type WAG Switches, in voltage rating from 7.5 to 230 kv and current ratings from 400 to 4,000 amperes, are fully described in our Bulletin No. 390-R. A copy of it is yours on request. Read it and find out why it will pay you to always specify Southern States Switches.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

The first cost of air-cooled transformers is not always the total final cost

1. *Because*

Some air-cooled dry-type transformers cost more to install than others.

1. *But*

SORGEL air-cooled dry-type transformers cost less to install because they are all self-contained in a single unit — either single phase or 3-phase — equipped with substantial wall brackets with slots for bolts, or with floor mounting base. No separate brackets to make or buy. Roomy connection compartment with wide choice of knock-outs. Equipped with solderless terminal lugs, and permanent connection diagram.

2. *Because*

Some require a larger rating for a certain load.

2. *But*

SORGEL transformers do not require a larger rating than the load, because they are guaranteed to carry their full rated load continuously. They are so liberally designed that they can safely carry a temporary overload.

3. *Because*

Some must be installed in locations that require longer feeders and more expensive wiring.

3. *But*

SORGEL transformers are so quiet in operation that they can be installed in almost any convenient place inside of buildings, close to the load center. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Complete Line

¼ Kva to 1500 Kva single phase.

1 Kva to 3000 Kva 3-phase, 2 phase, and phase changing.

All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltage.

SORGEL
AIR-COOLED
Dry-Type
TRANSFORMERS

Stock carried by jobbers in the following cities:

Milwaukee, Wis.
Chicago, Ill.
Rock Island, Ill.
Rockford, Ill.
Richmond, Ind.
New York, N. Y.
Buffalo, N. Y.
Roxbury, Mass.
Cleveland, Ohio
Louisville, Ky.
Omaha, Neb.
Davenport, Iowa
Cedar Rapids, Iowa
Beaumont, Tex.
Los Angeles, Calif.

Consult the classified section of your telephone directory or communicate with

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wisconsin

Pioneers in the development and manufacturing of Air-Cooled Dry-Type Transformers — For 40 years

With Insulating Oil...

"ALMOST DRY" ISN'T DRY ENOUGH

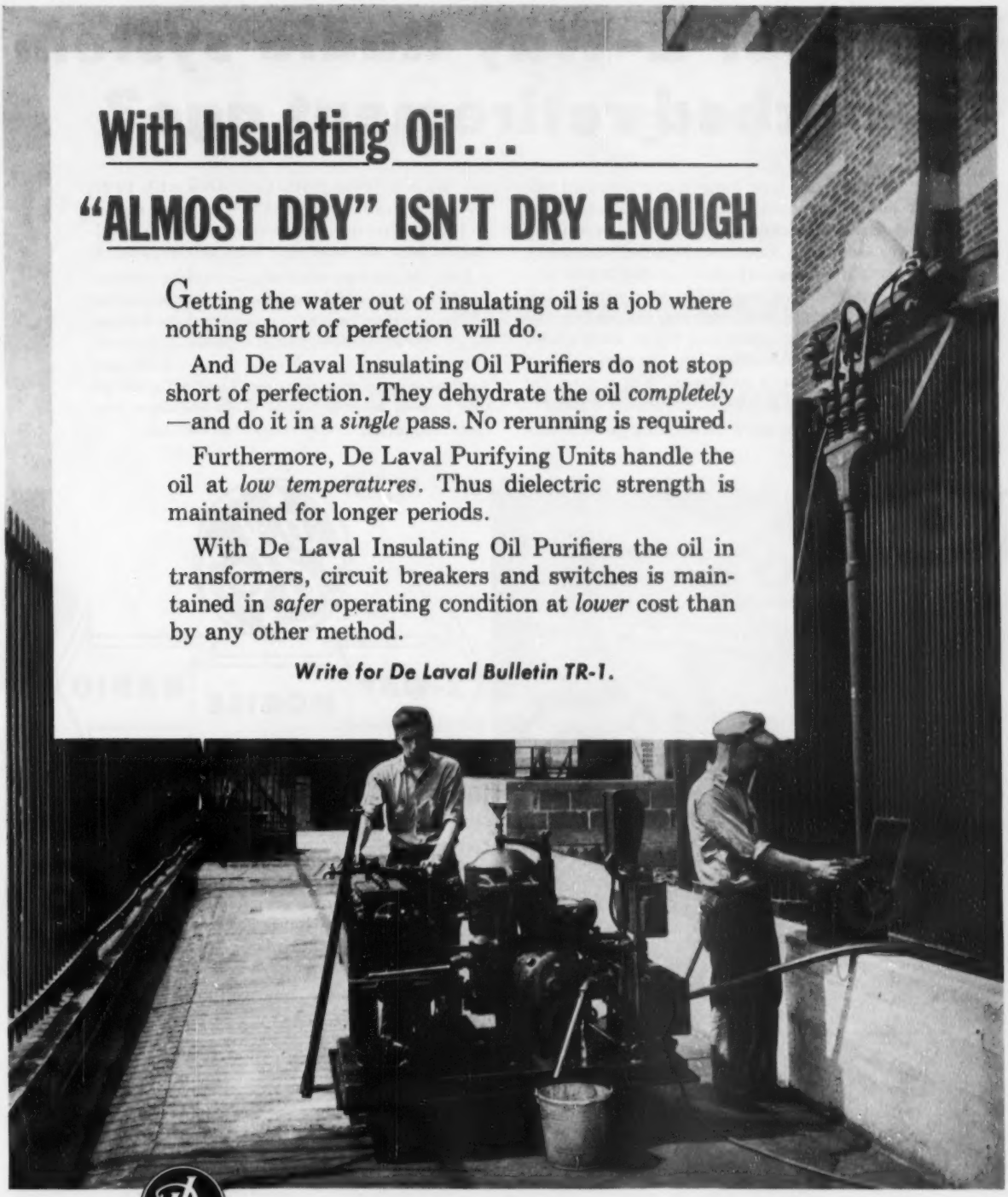
Getting the water out of insulating oil is a job where nothing short of perfection will do.

And De Laval Insulating Oil Purifiers do not stop short of perfection. They dehydrate the oil *completely* —and do it in a *single* pass. No rerunning is required.

Furthermore, De Laval Purifying Units handle the oil at *low temperatures*. Thus dielectric strength is maintained for longer periods.

With De Laval Insulating Oil Purifiers the oil in transformers, circuit breakers and switches is maintained in *safer* operating condition at *lower* cost than by any other method.

Write for De Laval Bulletin TR-1.



DE LAVAL

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York
427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO.
61 Beale St., San Francisco 5

GUARANTEED INSULATING OIL PURIFIERS

Has your 2-Way Radio system reached retirement age?

FORGET about how long you've operated one mobile communication system. Years aren't important. The *actual* age is measured by looking at yesterday's use. Look for abnormal road shock . . . severe weather exposure . . . day-in and day-out service because you *had* to work extra hours. Any or all of these conditions may have earmarked your 2-way radio equipment for an early grave. Find out too, if the system you are now using is adequate by today's standards. Will it meet the greatly expanded service needs of your industry?

Electric utilities show an amazing growth during the past seven years. Compared with 1947, kwhr demand has increased 75% bringing service to 11.5 million new customers. And, radio installations have *not* kept pace with this expansion.

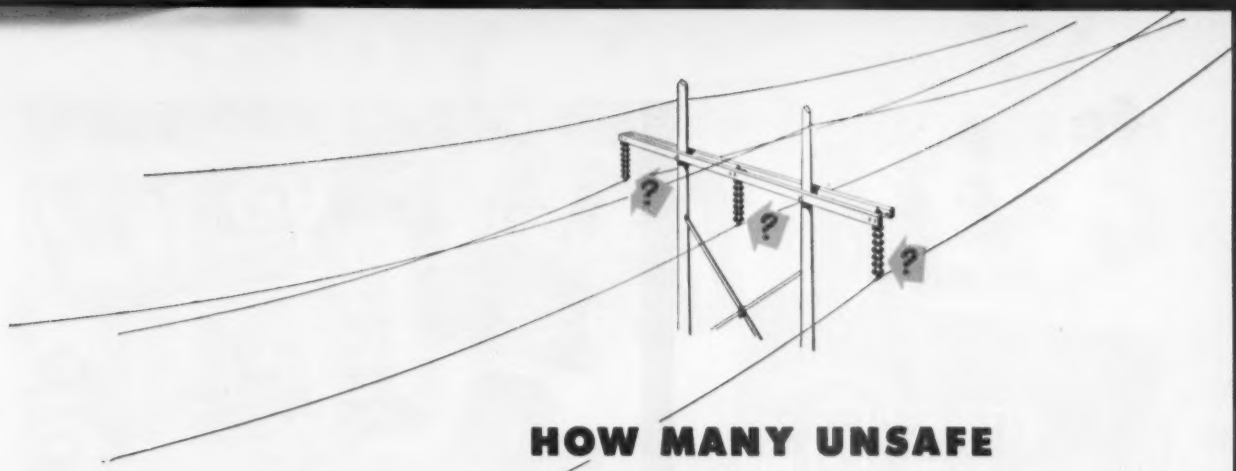
Find out the true value of your mobile communications today. If the system is sub-standard for any reason then be sure to compare these features on all new equipment: Initial expense . . . dependable performance *at all times* . . . long-life and *particularly* maintenance cost. The final score on this type of comparison will always show why General Electric 2-way radio is preferred.

2-WAY MOBILE RADIO

FREQUENCY STABILITY & SELECTIVITY
guaranteed for life!

A G-E COMMUNICATIONS COUNSELOR will provide valuable assistance in this program as well as on all communication problems. Call him at a local office or write us today: *General Electric Company, Section X1984-9, Electronics Park, Syracuse, New York.*

GENERAL ELECTRIC



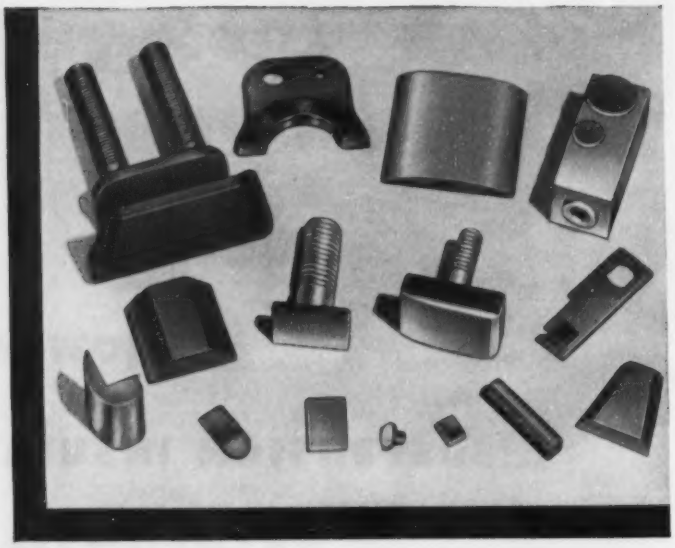
HOW MANY UNSAFE SUSPENSION INSULATORS ARE ON YOUR TRANSMISSION LINES?

As constructed today, transmission lines are pretty tolerant of suspension insulator quality. It is possible for a line to stay in service with a large proportion of sick, crippled or tired suspension units. But when the margin of safety runs out (and it won't be on a sunny June morning) the failure of such a "barely-in-service" line can be devastating indeed.

There is a difference in suspension insulator quality—which comes from differences in porcelain characteristics (electrical and mechanical), from differences in design, in hardware, in assembly techniques, in testing procedures. To get the differences on your side . . . to assure your system an extra margin of operating safety and security . . . long life . . . and low upkeep . . . build *your* transmission lines on Lapp suspension insulators.

Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp



For Breaking Heavy Currents

ELKONITE® Contacts

Have No Equal

Elkonite contacts give exceptional life and dependability in heavy-duty power interrupting service. They are made of an entirely different type of material, created by Mallory's exclusive techniques in powder metallurgy. In them are merged the refractory and arc-resistant qualities of tungsten, molybdenum or their carbides . . . plus the high current-carrying capacity of copper or silver.

These metals, which cannot be alloyed, are combined in the Elkonite process to produce a unique series of contact materials . . . with an unequalled combination of conductivity, resistance to arc erosion, impact strength and resistance to sticking. They provide characteristics far superior to those obtained with ordinary "powder metal" products.

The extensive selection of Elkonite materials offers a wide choice of physical and electrical properties. You're sure to find the exact contact material for your specific product . . . whether it be oil or air circuit breakers, heavy-duty controls, aircraft relays, starting switches or any other power-controlling device. Write today for a copy of the new Mallory Contact Catalog, which details the characteristics of all Mallory contact materials and includes valuable technical and design data.

● *Complete Contact Assemblies*

By manufacturing complete assemblies of contacts and backing members, Mallory can simplify your production and delivery problems . . . often at substantial savings. Write for information.

Expect more . . . Get more from MALLORY

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

Here's what happened when a utility

COMPARED ALL 3

Recently an eastern utility untanked and examined all three leading makes of voltage regulators. They checked design, tested and examined for ease of installation and service. Result: Allis-Chalmers distribution regulators came out on top; so they standardized on Allis-Chalmers.

Make Your Own Test

Allis-Chalmers will ship any recognized distribution system a Type JFR distribution regulator for 30 days' examination and tests completely free of charge. You can call in engineers, purchasing people, operating and maintenance men — anyone who wants to see for himself why your system gets the most for its money from Allis-Chalmers distribution regulators.

Get more information

Allis-Chalmers makes no claim you can't check for yourself. Contact the A-C office nearest you for complete information plus a "regulator check list" recently published, or write Allis-Chalmers, Milwaukee 1, Wisconsin to get a regulator with which you can make your own comparison.

A-4353

ALLIS-CHALMERS

ORIGINATORS OF 5/8% STEP REGULATION

TWO NEW CRESCENT SCREWDRIVERS FEATURE TENITE HANDLES

K1300 and K1500 series

K1700 series

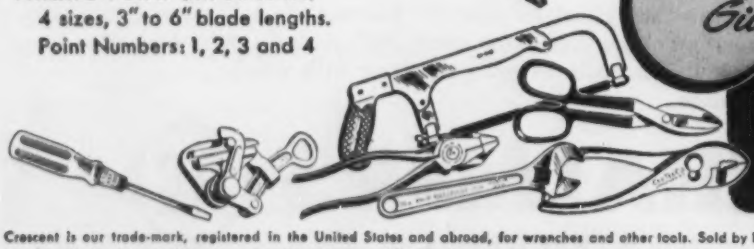
● Here's typical Crescent quality in a new line of plastic handled screwdrivers! Blades are hot forged and hardened full length. Then blade and handle are assembled under pressure so blade will never loosen. Finally, each screwdriver is individually tested to insure blade tips that will not break or twist.

You'll recognize these new Crescent Screwdrivers by their distinctive blue-colored Tenite handles, with soft-edged knurling that assures a sure grip without blistering the hand. Two patterns for slotted screws . . . one for Phillips head screws . . . in the sizes listed below.

STANDARD PATTERN (K1300 series)
5 sizes, 3" to 10" blade lengths.

CABINET PATTERN (K1500 series)
4 sizes, 3½" to 8½" blade lengths.

PHILLIPS POINT (K1700 series)
4 sizes, 3" to 6" blade lengths.
Point Numbers: 1, 2, 3 and 4



CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence

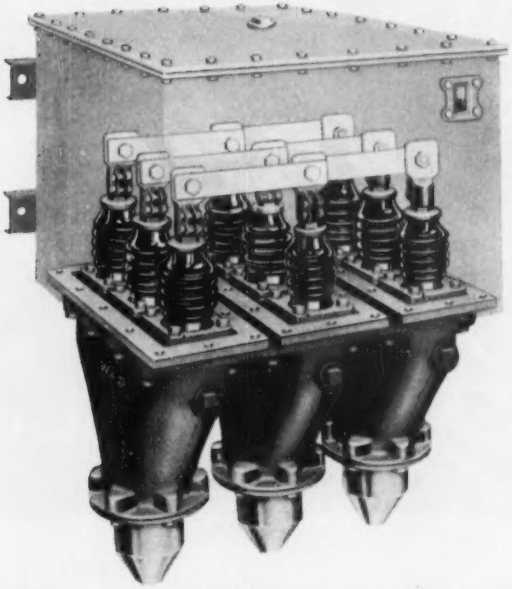
Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

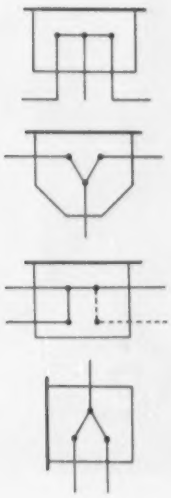
CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

save time and money by installing

TYPE "OL" Cable Boxes

to provide disconnecting links for sectionalizing





Heavy welded steel boxes with "Resistoyl" gasketed covers. Fitted with unit compound filled potheads for complete protection of cable ends. Location of potheads varied to suit installation conditions.

Boxes are filled with oil (or Askarel)—for minimum size and best electric characteristics.

"OL" boxes meet many requirements for non-load break sectionalizing and stop joint connection of cables up to 66Kv.

Send for new Bulletin BA52 on CABLE BOXES. (Page 10 list "OL" boxes rated 15Kv.)

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois

Representatives in principal cities of U. S. A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

B 541

G&W

WHY IT PAYS TO BUY MECHANICAL TUBING FROM US

You can reduce storage space, increase productive area

● There's no need of sacrificing large areas of valuable floor space for tubing storage when those areas *could* easily be made productive. Why not let *us* carry the storage and handling costs?

Our warehouses stock an exceptionally large variety of tubing products . . . in fact, no less than 531 sizes of Shelby Seamless Mechanical Tubing are readily available! So you can always count on quick delivery of exactly the type and size tubing you need . . . whether your order is by the inch or by the carload. And all our tubing products are made by the world's leading manufacturer of fine tubing and pipe—National Tube Division of U. S. Steel.

And, our extensive experience with tubing problems has often led to customer savings. For in many cases, our engineers can suggest a more economical type of tubing for your application.

Contact our nearest warehouse the next time you need quality tubing of any sort and in any quantity from our stock or directly from the mill: mechanical tubing, round and square, seamless and welded; boiler tubing, pressure tubing and pipe; and stainless steel tubing and pipe, seamless and welded.

TRIPLE SECURITY

What you want
When you want it
At the right price

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DIVISION

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USS

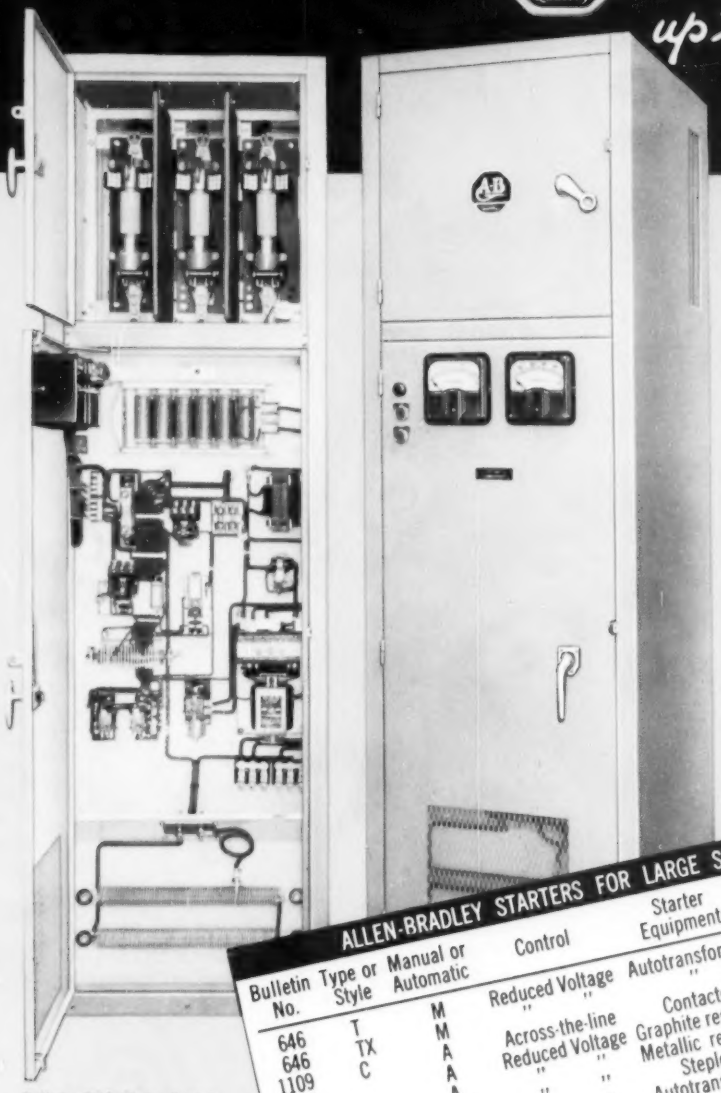
Warehouses and Sales Offices
Coast to Coast

USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

LIFETIME A-B STARTERS

up to 1500 HP



Bulletin 906 Style C high voltage synchronous motor starter with current-limiting fuses. Self-protecting against short circuits up to 150,000 kva on 2500 volts or 250,000 kva on 2501 to 4600 v. The high tension, solenoid operated, across-the-line oil-immersed switch is mounted in oil tank behind the panel. Cabinet has hinged doors on front and back.

There are 14 different types of these rugged Allen-Bradley starters. (See listings below.) Some are of the across-the-line type . . . but most of them are reduced voltage starters using resistors, transformers, or reactors during the starting period.

These starters are available in 2500 to 4600 volt ratings for squirrel cage motors from 700 to 1250 hp, and for synchronous motors from 800 to 1500 hp. They are listed for squirrel cage motors from 125 hp, 220 v to 600 hp, 440-550 v, and for synchronous motors from 350 hp, 220 v to 700 hp, 440-550 v.

For complete details, please send for the A-B Handy Catalog.

ALLEN-BRADLEY STARTERS FOR LARGE SQUIRREL CAGE MOTORS

Bulletin No.	Type or Style	Manual or Automatic	Control	Starter Equipment	Maximum Horsepower at Rated Voltage 220V	440-550V	2000-2500V	2501-4600V
646	T	M	Reduced Voltage	Autotransformer	125	250	700	1250
646	TX	M	" "	"				
1109	C	A	Across-the-line	Contactor	200	200		
740		A	Reduced Voltage	Graphite resistors	300	600		
741		A	" "	Metallic resistors	300	600		
742		A	" "	Stepless	300	600	700	1250
746		A	" "	Autotransformer				
1146	CT	A		"				

ALLEN-BRADLEY STARTERS FOR LARGE SYNCHRONOUS MOTORS

Bulletin No.	Type or Style	Manual or Automatic	Control	Starter Equipment	Maximum Horsepower at Rated Voltage 220V	440-550V	2000-2500V	2501-4600V
906	A	A	Across-the-line	Contactor	350	700	800	1500
906	C	A	" " "	"				
914		A	Reduced Voltage	Resistors	250	250		
922	AT	A	" "	Autotransformer	350	700	800	1500
922	CT	A	" "	"			800	1500
922	CR	A		Reactor				

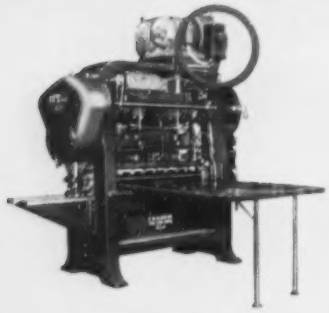
7-54-M

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

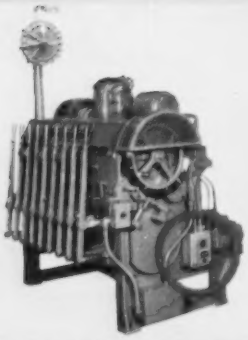
ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

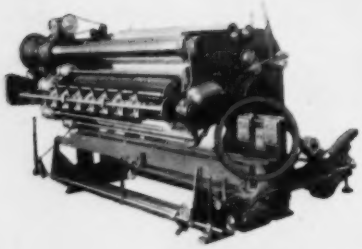
QUALITY



PERFORATING PRESS



GAS CONTROL



PAPER ROLL REWINDER

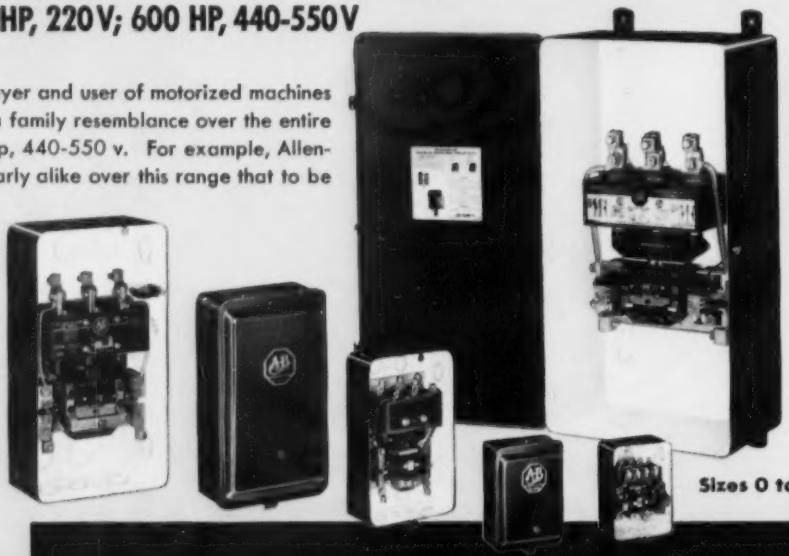
ACROSS-THE-LINE STARTERS FOR ALL TYPES OF MACHINES

A Uniform Line up to 300 HP, 220V; 600 HP, 440-550V

It is a distinct advantage to both buyer and user of motorized machines if the across-the-line starters have a family resemblance over the entire range up to 300 hp, 220 v; 600 hp, 440-550 v. For example, Allen-Bradley solenoid starters are so nearly alike over this range that to be familiar with the structure and operation of a 5 hp starter provides equal familiarity with an Allen-Bradley 500 hp starter. This advantage is limited only to the Allen-Bradley line.

Bulletin 709 solenoid starters are available in dust-tight, waterproof, explosion-proof, and corrosion-proof enclosures.

The Allen-Bradley Handy Catalog is a handbook of control information. Send for a copy.



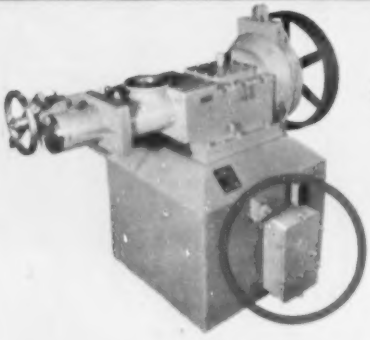
Sizes 0 to 5

A-B Quality

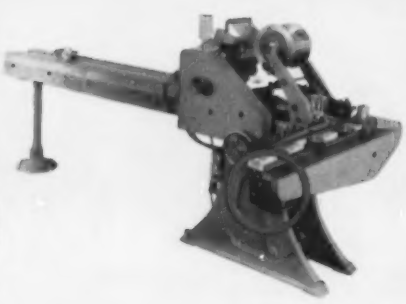
Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis

ALLEN-BRADLEY
SOLENOID STARTERS
QUALITY

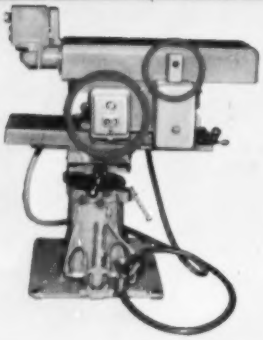
EXTRUDING MACHINE



WRAPPING MACHINE



BURR REMOVER



7-54-MR

When was the last time you took a good, close look at your communications?

To keep in step with your constantly changing business, your communication system should be examined periodically. In that way, your communications never become outdated — always meet your exact needs at the lowest cost. If you have Bell System service, such studies are a continuing activity.

Bell System communication engineers will also help you take a good, close look at your own communications . . . *at no cost to you!* Their detailed study will help you get the most efficient use of your facilities . . . whether they are long distance, mobile, teletypewriter, or metering and supervisory control.

A growing number of power companies are taking advantage of Bell System service in meeting the communications demands of modern operation.

• • •

If you are interested in a detailed communication survey by Bell System engineers without charge, call your local Bell Telephone representative now.

PRIVATE-LINE TELEPHONE

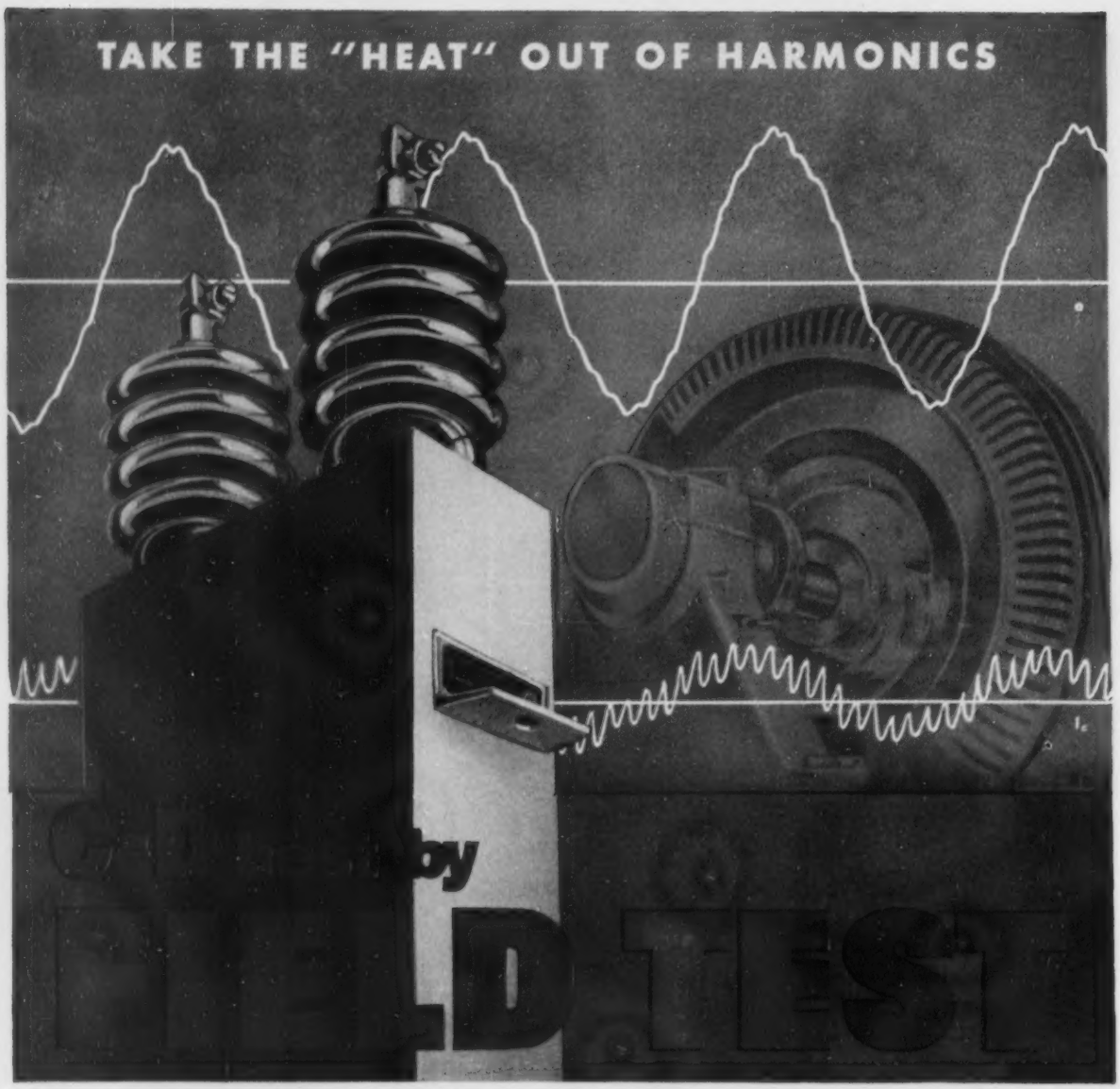
TELETYPEWRITER

MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM

TAKE THE "HEAT" OUT OF HARMONICS



e-wave form of voltage generated by an open slot type alternator of small kilovolt-ampere capacity.

I_c-capacitor current. The seventeenth harmonic in the voltage variation produces a pronounced seventeenth harmonic in the ic variation.

C-D capacitors are especially designed to withstand the recognized damaging effects of high harmonic component currents associated with many of the earlier type alternators.

Again, C-D's built-in margin of safety permits the highest degree of trouble-free service under the most severe operating conditions.

We'll be glad to have one of our field engineers graphically demonstrate the dollar-saving economy utilities have enjoyed with their C-D capacitor installations. And why only C-D pre-delivery quality tests all power-factor capacitors at full rated voltage. Cornell-Dubilier Electric Corp., Dept. D-84, South Plainfield, New Jersey.

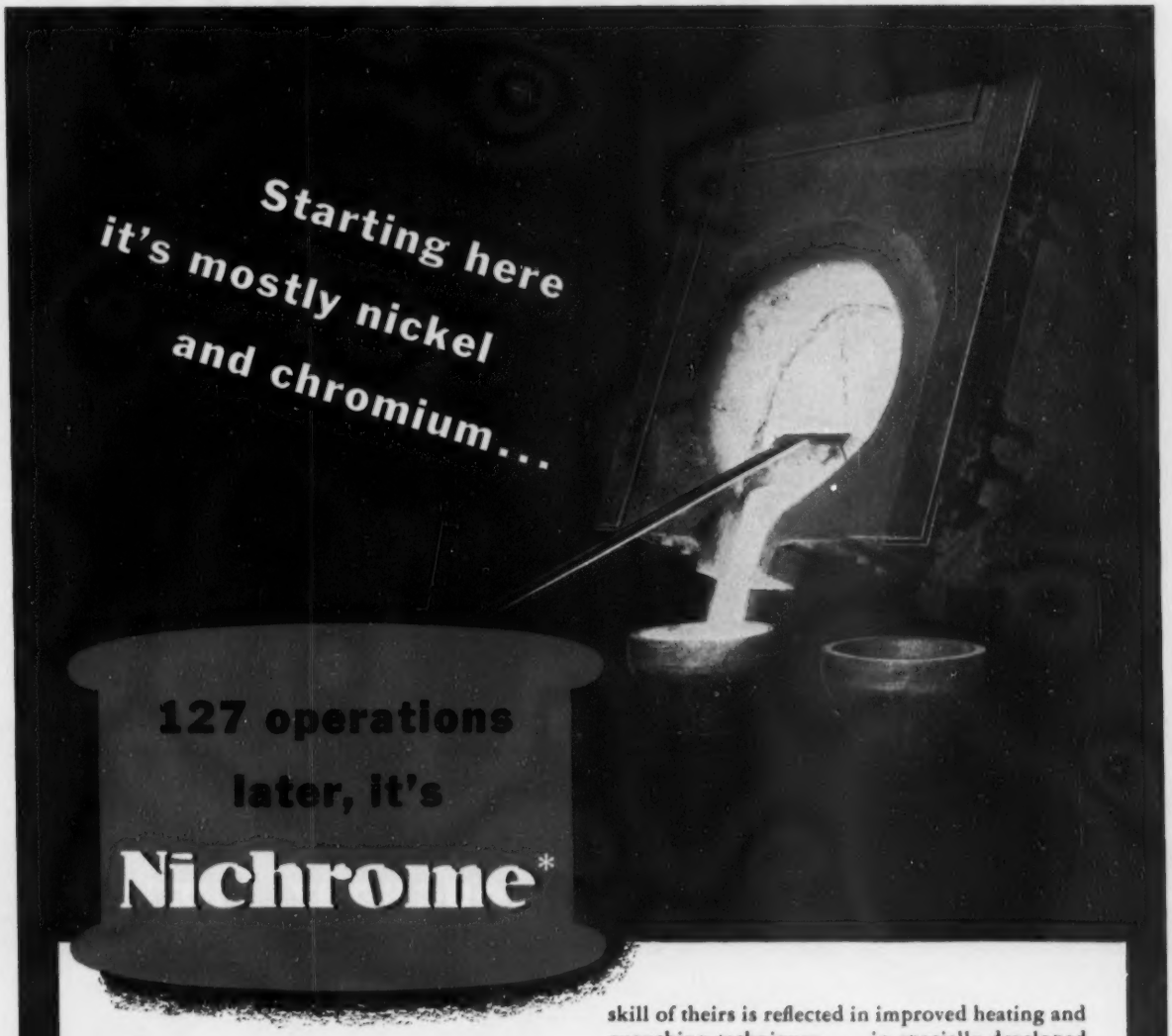
There are more C-D capacitors in use today than any other make

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

FOR POWER-FACTOR IMPROVEMENT

PLANTS IN SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY: THE RADIART CORPORATION, CLEVELAND, O.



127 operations later, it's Nichrome*

There are several excellent nickel-chrome combinations on the market. But there is only one Nichrome*.

What is it that makes this alloy the universal standard by which engineers judge the properties of heat and corrosion resistance? There is always at least one extra ingredient added to the nickel and chrome. That is . . . the supreme mastery of the Driver-Harris specialists, gained in their 55 years of melting and drawing experience. This hard-won skill of theirs is reflected in improved heating and quenching techniques . . . in specially developed deoxidizing anneals . . . in expert and precise control of every technical process of the entire manufacturing cycle. Sometimes, indeed, there are as many as 127 distinct operations between melting crucible and the finished wire, strip, or rod.

In recognition of its unique properties, the United States Patent Office in August, 1908, granted solely and exclusively to us the trademark NICHROME. There is only one Nichrome, and it is produced by Driver-Harris.

Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Louisville, Los Angeles, San Francisco

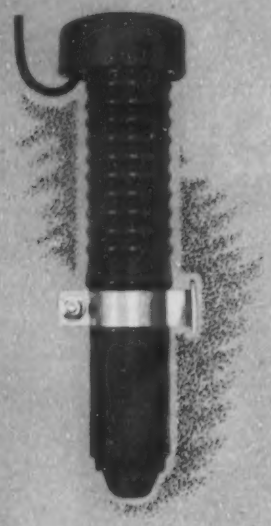
In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

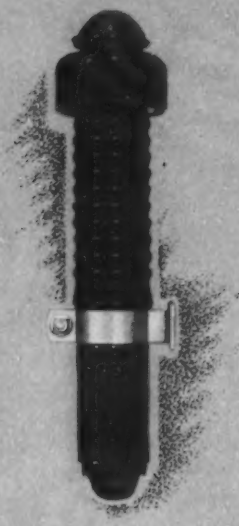
Visit Driver-Harris at the Philadelphia Instrument Show—Booths 559-561

*T. M. Reg. U. S. Pat. Off.

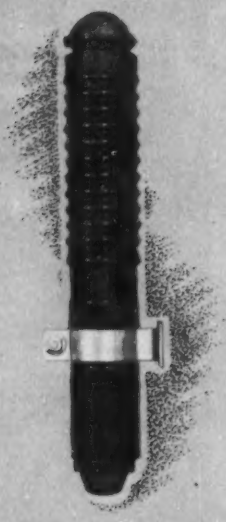
COMPLETE LINE



Non-Ventilated Spark Gap Construction.
Line Lead-Ground Stud Terminals

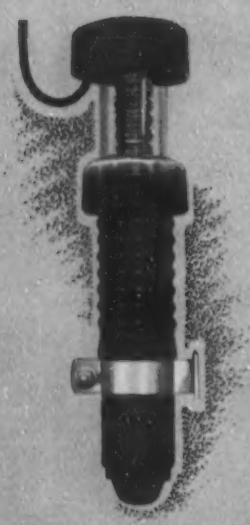


Non-Ventilated Spark Gap Construction.
Line Stud-Ground Stud Terminals

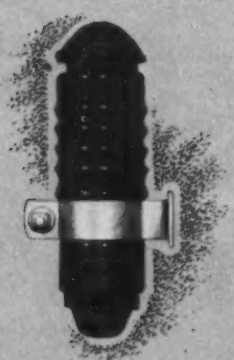


Ventilated Spark Gap Construction.
Line Stud-Ground Stud Terminals

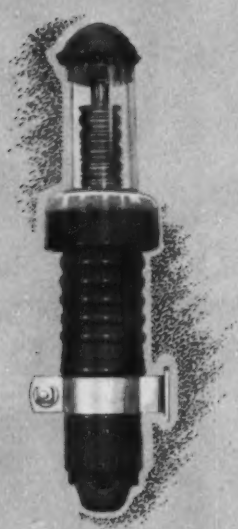
PERFORMANCE-PROVED THROUGHOUT THE WORLD



Ventilated Spark Gap Construction.
Line Lead-Ground Stud Terminals



Ventilated Spark Gap Construction.
Line Stud-Ground Stud Terminals



Ventilated Spark Gap Construction.
Line Stud-Ground Stud Terminals

ELECTRIC SERVICE MANUFACTURING CO.

Proved Protection

...for every distribution line

CRYSTAL VALVE ARRESTERS

Whatever the type, voltage or location of your distribution lines or transformers for distribution lines there's a Crystal Valve Arrester "Job Engineered" to give maximum protection in all types of weather and lightning conditions.

CRYSTAL VALVE VENTILATED GAP ARRESTER

High-speed, multiple arcing spark gap unit protected from corrosion by vents which permit the movement of air . . . prevent the accumulation of moisture in the housing. These vented gap arresters are available in both all-porcelain and porcelain-glass housings. Their amazing all-round performance is proved by the thousands in service which have achieved better than 99% perfect protection. Range in maximum permissible line-to-ground voltages of 3,000 to 18,000.

CRYSTAL VALVE SEALED TYPE ARRESTER

Embodies time-proved accurately spaced, high-speed multiple spark gap units and electrodes with discharge surfaces that are smooth and flat. Oxidized Silicon Carbide valve element provides low discharge voltage drop and high discharge capacity . . . true valve action in conjunction with high-speed spark gap assembly interrupts follow current if present . . . no measurable deterioration after years of service. Range in maximum permissible line-to-ground voltage of 3,000 to 25,000.

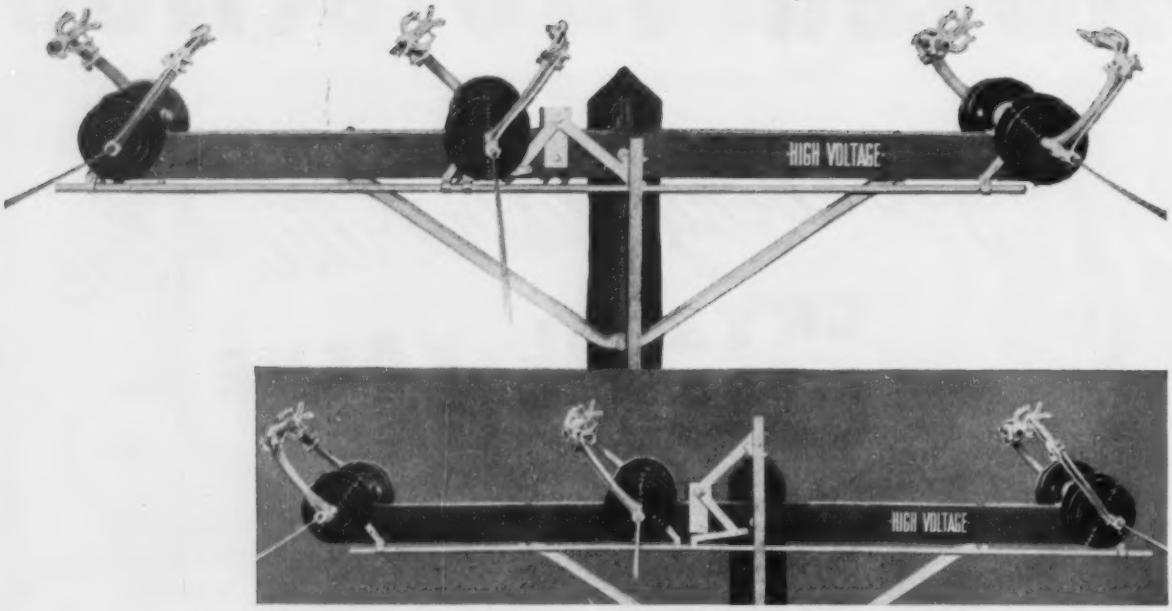
To be certain your lines and transformers have maximum protection at all times let Electric Service engineers show you how "Job Engineered" Crystal Valves assure positive protection.

Write for your copy of "Proved Protection"—giving all of the inside facts you should consider in selecting lightning arresters.

CRYSTAL VALVE LIGHTNING ARRESTERS

Philadelphia 32, Penna.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto



Note clean, neat pole top appearance of KPF switches open (top picture) and closed. Appearance is marked contrast with usual clutter of mechanism.

Simple design and sturdy construction insure years of trouble-free switching

KPF Air Break Switches look different because they *are* different. They are the simplest air break switches made. They consist of two rigid dead-end insulator assemblies with rigid jumpers forming the switch arms. One assembly is mounted stationary to the cross-arm. The other rotates to make and break the circuit. There are no complex parts to get out of order, require lubrication, adjustment or other service. Sturdy KPF switches serve indefinitely.

Simple design also means simpler manufacturing and lower cost. No separate dead-ends or extra insulators are required.

Finally, installation normally requires less than half the normal time. Phase units are shipped ready for use and need only be bolted to the cross-arm.

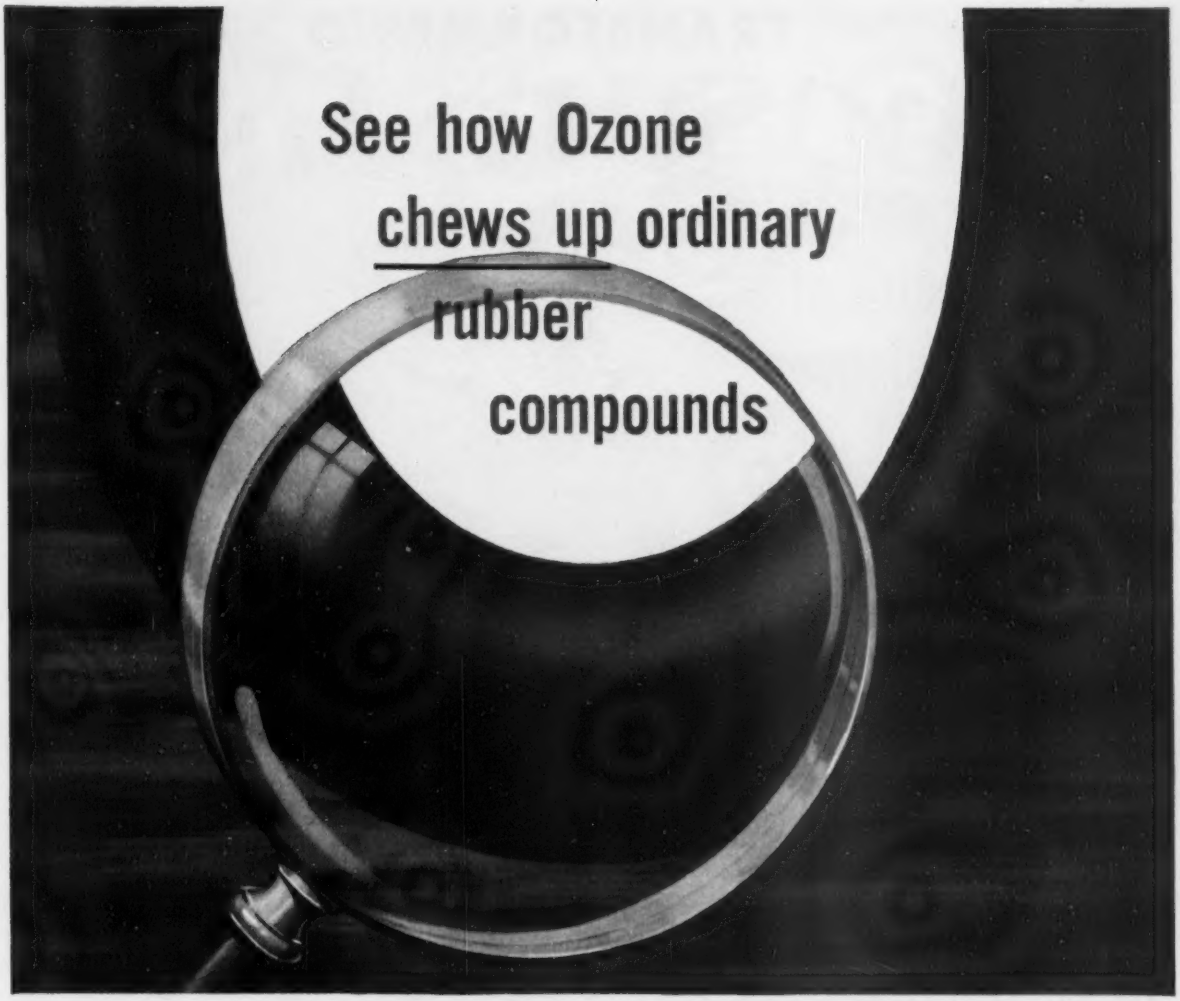
KPF Air Break Switches have been used for almost 50 years on lines ranging from 7.5 to 110 kv. Tens of thousands are in use today by Pacific Gas & Electric, Southern California Edison, Minnesota Power & Light and other leading power companies.

For the world's simplest, surest, lowest cost air break switch, specify KPF Air Break Switches—standard for nearly 50 years.

New catalog gives complete specifications, detail drawings, installation information.

KPF ELECTRIC COMPANY
1624 East Alpine Avenue, Dept. E, Stockton 5, California

KPF
AIR BREAK SWITCHES
Standard for nearly half a century



but not U. S. Grizzly Uskorona-insulated power cables

Here's an illustration showing how ozone can chew up a sturdy, rugged cable. This can never happen with United States Rubber Company's famous Grizzly® power cables, insulated with Uskorona® compound which prevents electrical failure caused by ozone (Uskorona-1 oil base compound and Uskorona-2 butyl base compound). Uskorona meets (and in many ways exceeds) the applicable IPCEA specifications for ozone-resistant rubber insulation.

U.S. Grizzly Uskorona-insulated Power Cable, 15,000 volts, Type RR, 3 conductor, shielded, Neoprene jacket

U.S. Grizzly ozone-resistant power cables are typical of the wires and cables "U.S." develops to meet the ever-increasing rate of expansion of electrical generation and construction. "U.S." is always ready with new products to meet new demands and is always developing, as a matter of policy, wires and cables that are more economical because they are more serviceable.

Send for free illustrated book giving full information about U.S. Electrical Wires and Cables for the Electric Utility Industry.

US RUBBER

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE & CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

TRANSFORMER Treasure Hunt

General Electric offers a new transformer for oldest G-E unit in ASA range

To promote the benefits of standardized transformers and to commemorate the dedication of its new Repetitive Manufacture transformer plant, General Electric plans a unique monument. The Company is sponsoring a "treasure hunt" to find the oldest G-E (or Stanley Electric) transformer in the RM range of ratings that was still in operation on May 11, 1954, the day the plant was dedicated. The prize, in exchange for the oldest unit, will be a new G-E self-cooled, oil-insulated transformer of equivalent rating delivered free of charge.

BONUS PRIZE FOR REPLACEMENT BY RM UNIT

If the winning transformer can be replaced with an RM unit having kva and voltage ratings and impedance values which are listed in the ASA standard, there will be an extra bonus in the form of an all-expenses paid trip to G.E.'s new Rome, Ga., plant for a man in the winner's organization.

WHO CAN PARTICIPATE?

All electric utilities, manufacturing, and transportation companies are invited to take part in this nationwide transformer "treasure hunt."

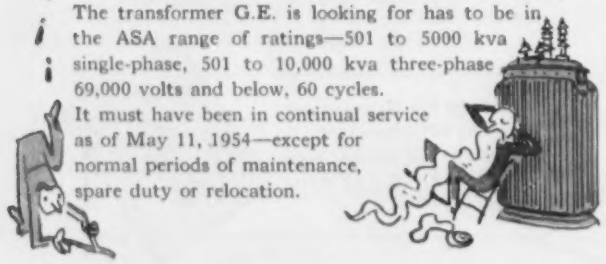
HOW TO ENTER THE "TREASURE HUNT"

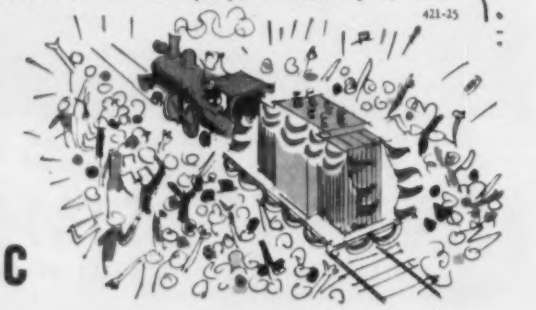
It's easy to enter the treasure hunt. It's fun. And it may be profitable. But, do it right away. Your entry must be post-marked not later than November 1, 1954. If you have a transformer "old timer" still in operation, why not ask your G-E Apparatus Sales Representative for a "treasure hunt" entry blank. Or write for Entry Form GEZ-1046. General Electric Company, Schenectady 5, N. Y.

421-25

WHAT TRANSFORMER WILL QUALIFY?

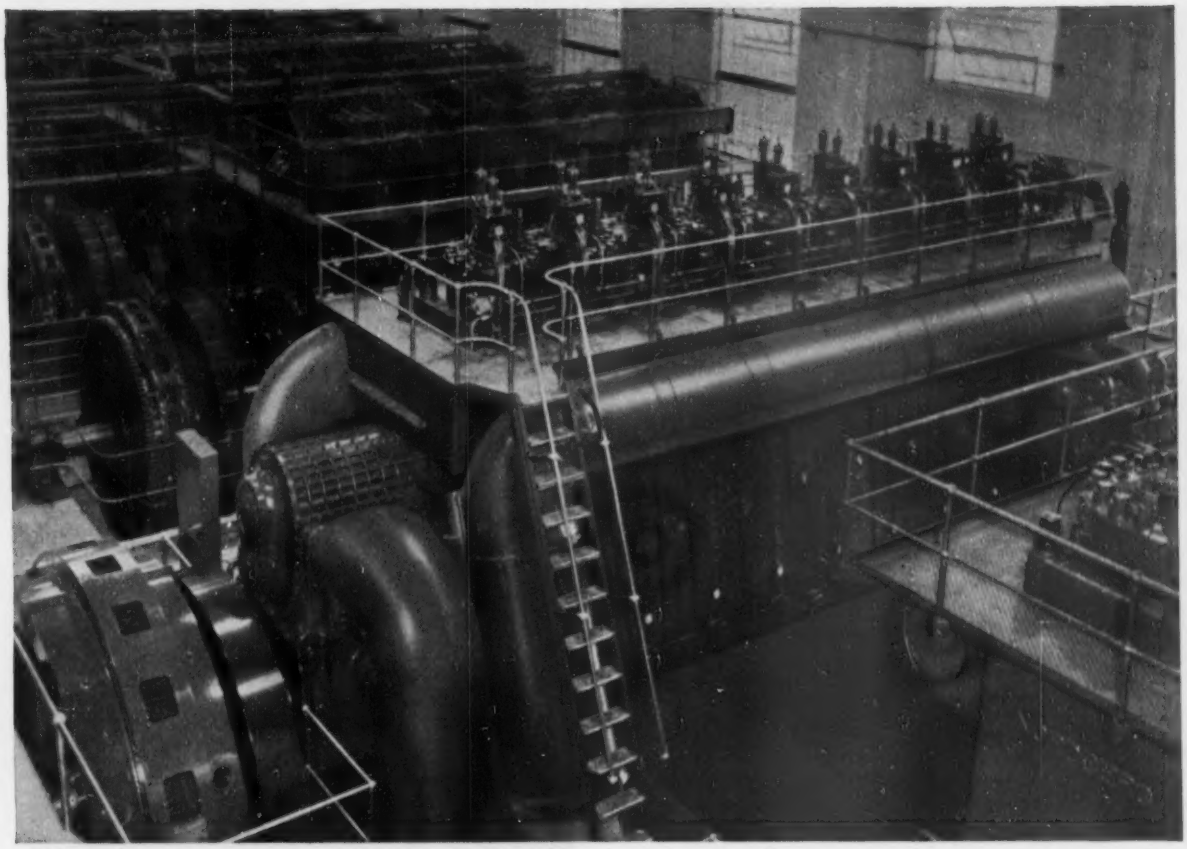
The transformer G.E. is looking for has to be in the ASA range of ratings—501 to 5000 kva single-phase, 501 to 10,000 kva three-phase 69,000 volts and below, 60 cycles. It must have been in continual service as of May 11, 1954—except for normal periods of maintenance, spare duty or relocation.





Progress Is Our Most Important Product

GENERAL ELECTRIC



Largest Diesel Power Generating Station in the U.S.

reduces cylinder and piston ring wear with SHELL ROTELLA OIL

Electric power for the City of Grand Haven, Michigan, and the surrounding area, is generated by diesel engines in the largest municipal power station of its kind in the U. S. A. Shell Rotella Oil is the cylinder lubricant.

The anti-corrosive action in Shell Rotella Oil combats the major cause of engine wear . . . cylinder and piston ring wear caused by acid action from the by-products of incomplete combustion and condensation.

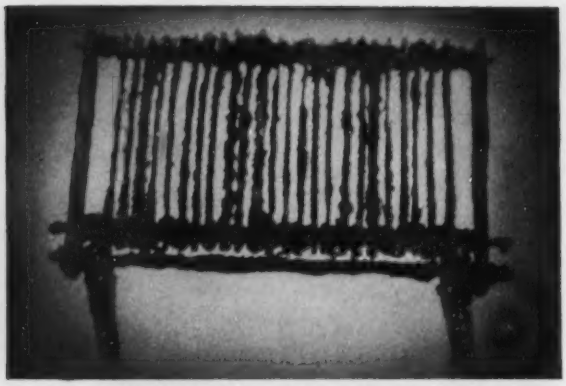
Tougher lubricating film in Shell Rotella Oil gives cylinders and rings greater protection . . . minimizes wear. Its effective detergent-dispersant action prevents harmful deposits.

Write for technical information. See for yourself how Shell Rotella Oil can help reduce your engine maintenance costs.

SHELL OIL COMPANY
50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

LABORATORY TESTING—The modern Chase laboratories provide an excellent testing ground for condenser tubes under conditions met in many varied industries.



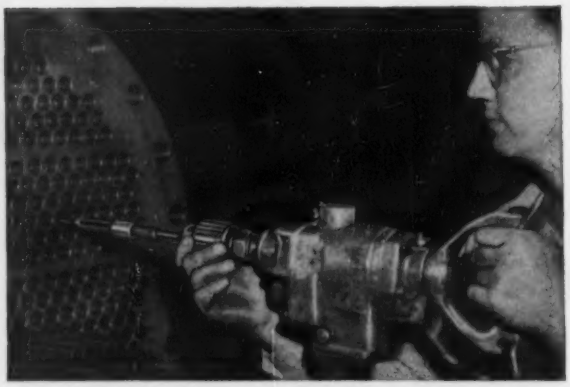
FIELD TESTING—This rack of test specimens was in a heat exchanger. These field tests help Chase perfect the alloy best suited for *your* job.

How to be *SURE* about CONDENSER TUBES

Take Chase Antimonial Admiralty or Cupro-Nickel Tubes, for instance. You *know* they'll give you years of service. They're manufactured under carefully controlled conditions. They're tested for every stress, strain and attack. They're inspected again and again. When a Chase condenser tube goes into service we're *sure* it will stand up. You can be sure, too.

Prompt Shipments from Mills in Cleveland and Waterbury

CARE IN MANUFACTURE—During every step of the way from casting to packing, Chase tubes are carefully supervised and continually tested.



YEARS OF ACTUAL USE—Chase condenser tubes and heat exchanger tubes save industry thousands of dollars annually . . . because they last longer.

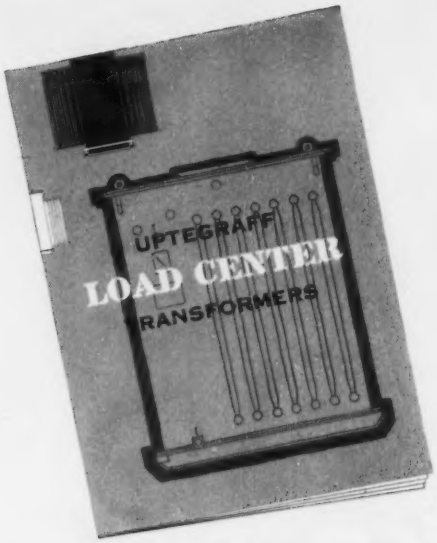
Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)



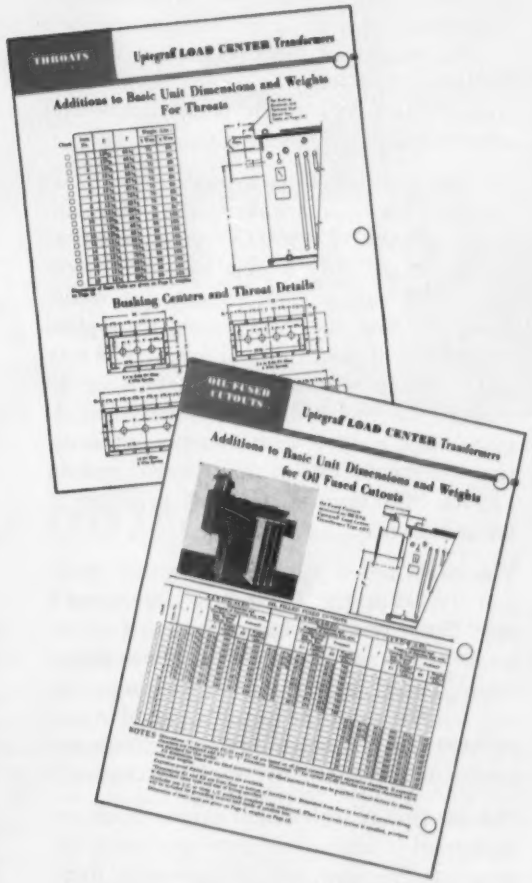
Uptegraff Announces a complete series of

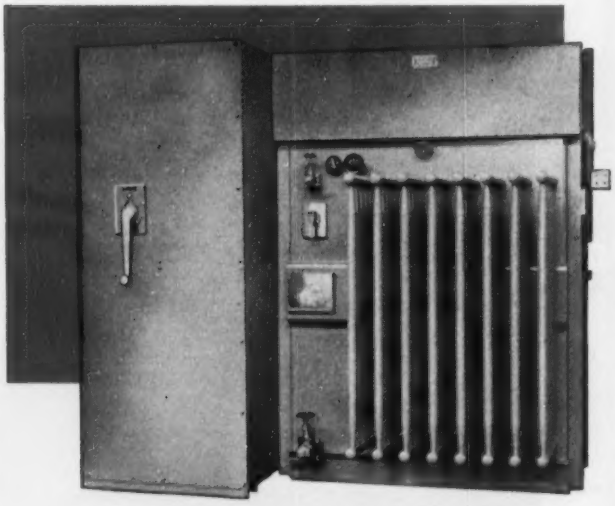
LOAD CENTER TRANSFORMERS

(150-2500 KVA)

Uptegraff announces a new series of *Liquid Filled* Load Center Transformers, made in eighteen ratings, from 150 to 2500 KVA., 3-phase. Designs are based upon extensive experience with this type of transformer, and represent modern engineering and manufacturing practice.

To simplify the selection and arrangement of auxiliary equipment, we have prepared a unique brochure, some pages of which are shown here. With this brochure, you can readily determine overall dimensions, total weights and other information for any combination of the Basic Transformer Unit with various types of switches and accessories. A check system permits the easy and accurate locating of desired data pertaining to various arrangements of properly rated equipment for any selected basic unit. We will be glad to send you a copy, free.


THROATS
Uptegraff LOAD CENTER Transformers
Additions to Basic Unit Dimensions and Weights For Throats
Bushing Centers and Throat Details
OIL FUSED CUTOUTS
Uptegraff LOAD CENTER Transformers
Additions to Basic Unit Dimensions and Weights for Oil Fused Cutouts
NOTES



R. E. Uptegraff Manufacturing Co.
Scottdale, Pennsylvania

Send **for a free copy of this 20-page data book, giving important and useful information on Uptegraff Load Center Transformers. Fill out and mail the coupon below.**

R. E. Uptegraff Manufacturing Company
Scottdale, Pennsylvania

Please send a copy of your LOAD CENTER TRANSFORMER brochure, Catalog 132, to:

Name_____ Position_____

Company_____

Address_____

EW-8

The instrument that put electronics to work

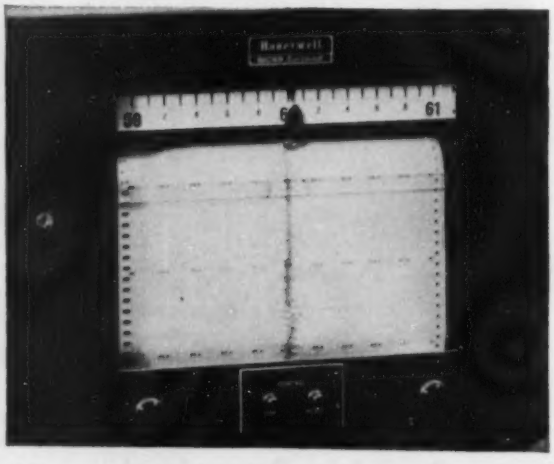
Before electronics came into the picture, industrial instrumentation was caught in a squeeze. On one hand, it was besieged with demands by production men and engineers for higher sensitivity, faster speeds, and greater reliability. And on the other hand, it was hampered by the limitations of mechanical devices. For the instruments of fourteen years ago were merely mechanical imitations of a man watching a galvanometer needle and twiddling dials. They were too delicate . . . too sensitive to vibration . . . too easily led astray by wear or maladjustment. They just couldn't deliver the performance that new production methods required.

In 1940, however, came a major milestone in the progress of instrumentation—development of the *ElectroniK* potentiometer. This was not only a new kind of instrument. It was a new concept of measurement. For the first time, it applied the science of electronics in a practical way to the design of a measuring device for industry. It replaced complicated, fragile mechanical gadgets with a simple but sensitive electronic circuit and servo system . . . the "Continuous Balance" principle of measurement.

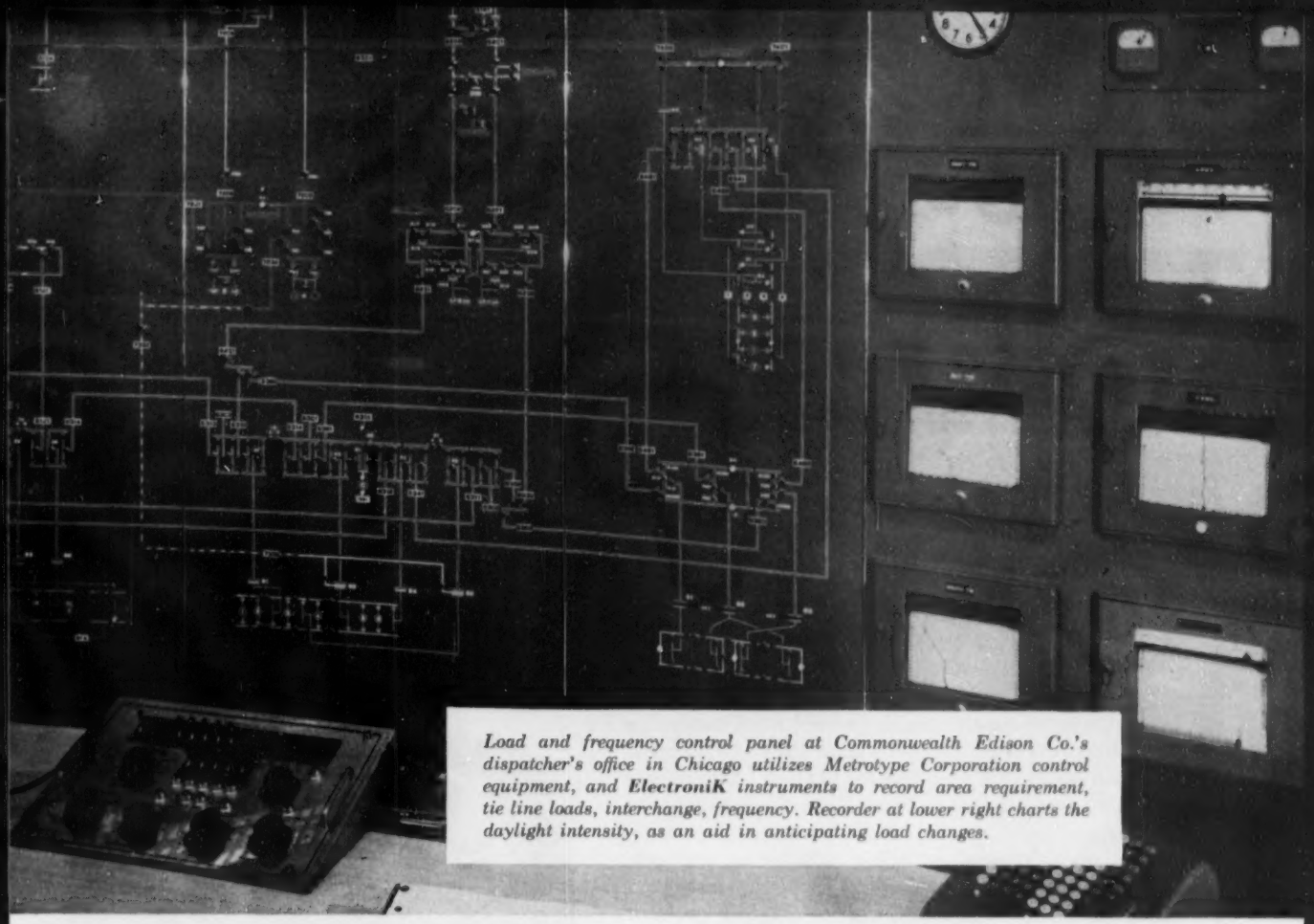
You could tell it was something new when you opened up the *ElectroniK* instrument's case. There was no sign of whirring gears, levers and cams. You could tell it was giving a new kind of performance in measurement, too, by the way the pointer would move swiftly and surely in one smooth sweep whenever the measured variable changed.

The *ElectroniK* instrument gained quick acceptance by production men, engineers, research technicians and maintenance men. They liked the way it provided laboratory accuracy and sensitivity, week after week, under the toughest industrial service conditions. They found that its speed and precision made possible improvements in product quality and process operation that had been unattainable before. And they have proved their confidence by ordering and reordering *ElectroniK* instruments by the thousands . . . not solely because it was *first* of its kind, but because it has continued to be the *best* in performance.

ElectroniK instruments play vital part in *all-electronic*



"Continuous Balance" principle of measurement, pioneered in ElectroniK instruments, affords the precision, speed and dependability demanded by modern system control.



Load and frequency control panel at Commonwealth Edison Co.'s dispatcher's office in Chicago utilizes Metrotype Corporation control equipment, and ***ElectroniK*** *instruments to record area requirement, tie line loads, interchange, frequency. Recorder at lower right charts the daylight intensity, as an aid in anticipating load changes.*

load and frequency control

WITH THE installation of the control instrumentation pictured above, load dispatching at the Commonwealth Edison Co. has taken another step forward. This modern, fully electronic equipment concentrates at the load dispatcher's fingertips all the data he needs to supervise interchange between systems . . and the means for its automatic control.

Integrated into an electronic load frequency control system are a number of *ElectroniK* instruments, which perform diversified functions essential to control of tie line loads and system frequency. Operating in conjunction with existing mechanical type instruments, *ElectroniK* instruments measure and record individual tie line loads, net loads on east and south ties, net area interchange, and frequency. By feeding accurate data into the control equipment, they contribute greatly to the precision and dependability of system regulation.

In utilities throughout the country, the precision and versatility of *ElectroniK* instruments are proving invaluable in a wide variety of measuring and controlling problems. Their simple, rugged design has enabled them to set high standards for continuity of service.

Your nearby Honeywell sales engineer will be glad to discuss your specific applications for *ElectroniK* instruments. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for Catalog 90-2, "Supervisory Instrumentation for Power Generation," and for Catalog 9050, "Supervisory Instrumentation for Steam Generation."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Pace-Setting Power

75,000-kw unit at Wisconsin Power and Light Company's new Rock River Station combines first side-crossover tandem-compound steam turbine and modern supercharged hydrogen-cooled 3600-rpm generator

FOR YEARS the demand for electric power has continued to soar in the industrial-agricultural area served by the Wisconsin Power and Light Company. To match the growing load, this pace-setting Allis-Chalmers turbine-generator combination was recently placed in operation at the new Rock River Station near Beloit, Wisconsin.

The 75,000-kw tandem-compound turbine at Rock River is representative of Allis-Chalmers double-flow, 3600-rpm reheat turbines for ratings of 75,000 to 150,000 kw. The generator incorporates supercharged internal rotor conductor cooling — operation-proved since 1951 at Wisconsin Power and Light's Edgewater Station. A duplicate 75,000-kw unit for the Rock River Station is under construction.

You can depend on Allis-Chalmers for pace-setting turbine-generator units engineered to meet your requirements — in ratings up to 500,000 kw. For more information, contact your nearby A-C representative. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4383

Turbine Innovations

Side crossovers simplify removal of upper casing for inspection and enhance turbine appearance... double-casing HP cylinder... patented isothermal reheat diaphragm . . . all-steel LP casing . . . simplified main oil-pumping system with basement-located oil tanks and centrifugal pumps . . . more instrumentation and control at No. 1 pedestal.

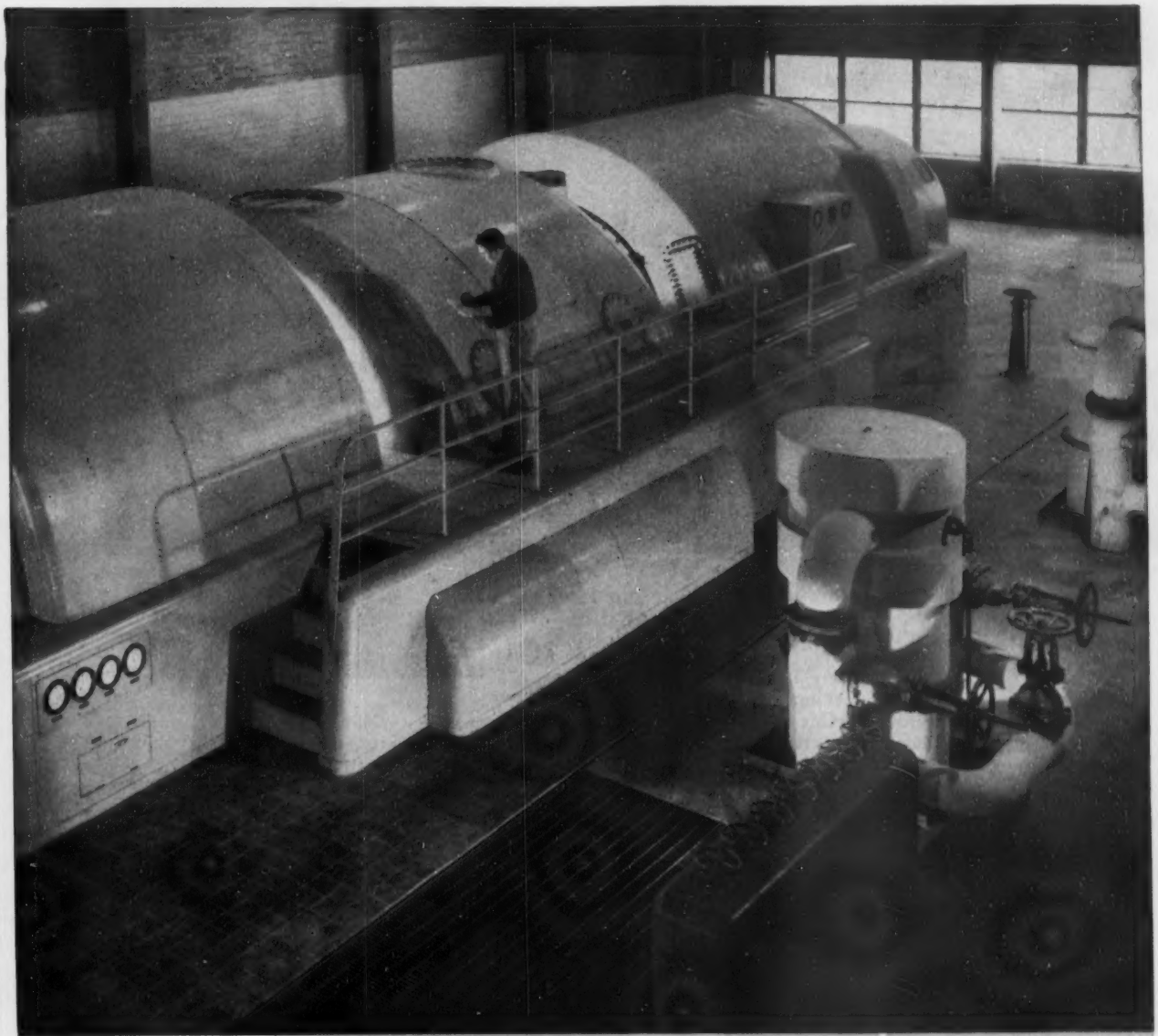
Generator Features

Supercharged cooling permits reduced plant size, lower foundation and crane costs, and smaller breakers and bus structures . . . flexible stator core support design . . . thrust-type shaft seals . . . simple, centralized hydrogen control mounted on generator.

1904 50 1954
YEARS
TURBINE

ALLIS-

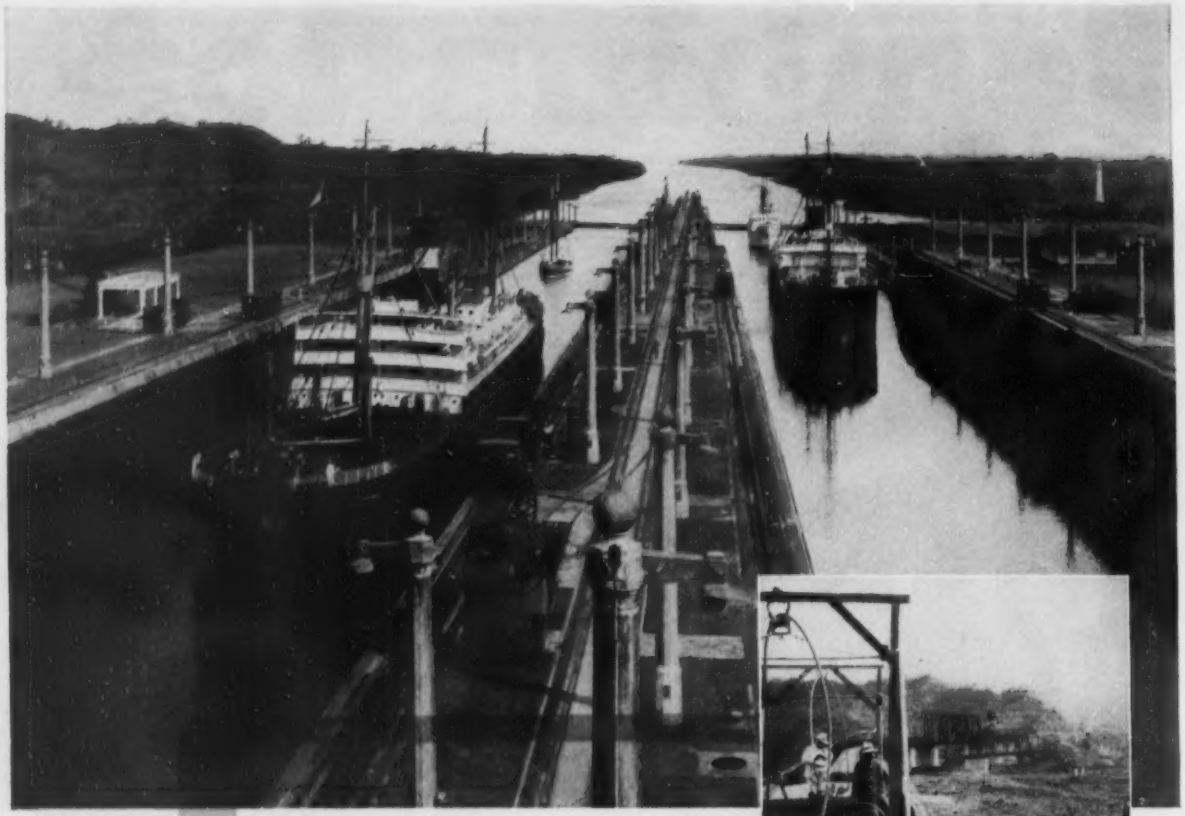
Combination



Steam conditions for this 75,000-kw, 3600-rpm turbine are 1450 psig, 1000 F inlet, 1000 F reheat, 1.0-inch mercury absolute exhaust. Generator rating is 12,500 volts, 0.8 short-circuit ratio, 75,000 kva at ½-pound hydrogen pressure, 93,750 kva at 30-pound hydrogen pressure.

CHALMERS

A-C ALLIS-CHALMERS



The Panama Canal

Laying Kerite Cable across the Isthmus, 1908

Since it was first manufactured almost a century ago, Kerite insulated cable has been closely integrated with the international development of the communications industry. One of the most important installations of Kerite cable was made in 1908 across the Isthmus of Panama, a distance of 50 miles, uniting the Atlantic and Pacific ocean cables.

Early performance records of this outstanding product indicated that Kerite cable was unusually well equipped to withstand the extremely severe conditions attending this tropical installation. This cable, originally laid on the ground in the jungle, was submerged for 30 miles in Gatun Lake upon completion of the canal.

As a result of the operation of this initial cable, a second one was installed in underground ducts in 1918 under the supervision of Mr. C. R. R. Harris, now President of The Kerite Company. Subject to similar adverse conditions, this cable continues to perform the important function for which it was designated at a critical point in communications history.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

100 DAYS WITH KERITE 100th Anniversary 1854 1954

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

EDITORIALS

Nuclear Power Progress Can Be Speeded

Almost phenomenal progress has been made in nuclear power in the last six months. Before that hardly anyone promised a physically feasible plant in less than ten years, and each asked for another ten to establish economic practicality. More recently these periods have been halved, not once but twice, and the hope is now held out that nuclear kilowatts will be on the line within three years.

Perhaps that is as much progress as could rightfully be expected or even digested by the utility industry. Near future prospects look good if one looks at the zeal with which utilities continue to explore the multiplicity of possible reactors and heat extraction schemes. Prospects may not rate so good if one views the hesitancy in establishing the relative merits of the possible combinations of reactors, fuels, moderators, coolants, etc.

Granted that it takes time to run down the merits of the many different schemes. The uncertainity at the moment is whether the time is not being unduly prolonged by relying on several different teams working more or less independently. Once a team or an individual explorer has focused attention on a particular pattern of reactor for power purposes there can easily be a degree of reluctance to abandon it in favor of an alternative scheme that has non-competitive acceptance. One might even suspect a bit of the face-saving attitude that typifies Asiatic political diplomacy. Insofar as this mood exists or is likely to arise, an attractive "out" should be devised.

What could be seriously wrong with setting up a manufacturing pool to coordinate present disjointed efforts to make nuclear power feasible and competitively economical? It could provide a means for stimulating calm and logical decisions by a composite staff dedicated to sustainable composite answers on each detail. The program (without aiming for "crash" speed) could be accelerated and further exploratory money saved by compounding the best of the component decisions into an optimum whole. This would be more than a debating society—it would constitute a working, productive route to a saleable end. The pooled technology would be able to offer the nuclear power field the best possible developments in facilities whether for small mobile power, for propulsion in submarine, aviation and rail fields, for export to industrially backward nations, and, above all, for sale of big units which utility power plants require.

Utilities could well stay out and let the equipment manufacturers merge their efforts toward the end indicated. Utilities need not hazard capital funds until a physically workable and economically feasible plant is ready to purchase. Then they would presumably do as they have consistently done when building orthodox steam plants; namely, stipulate names of makers of each constituent piece of equipment no matter who designs the plant as a whole. Individual manufacturers in the pool thus would still have to compete for their share of the nuclear equipment business. That feature alone should forestall any cry of "monopoly."

The Atomic Energy Act now apparently sanctions the pooling pattern outlined. Each manufacturer of reactors and accessories should ask himself whether he would not gain more than he sacrifices by entrusting his present nuclear ventures to an industry hopper for the sake of a sounder and faster progress in "power from reactors."

Adequate Wiring Attracts the Gyp

It can now be announced with certainty that the awakening of the national consciousness to the need for adequate wiring is well along. This is not to say that continuing effort to accelerate that awakening is no longer required. It is merely to note that significant progress has been made. The gyp artist has now made his entrance on the scene. And when a movement has reached the stage to attract such gentry, it can be said to be started strongly on its way.

From California comes report of "pitch" salesmen posing as power company representatives making a survey to see if homes were adequately wired. After the initial approach, high pressure deal closers would go to work saying the wiring was unsafe, and "proving" it by plugging-in a gimmick of wires and coils that glowed red with heat and crackled and buzzed most horribly. Then the home owner would be told not to use television, radio, any appliance, until the house had been adequately rewired. A rewiring contract—salable to a licensed contractor at a nice profit—then was easy picking.

Those who are giving their all of soul and strength to the promotion of adequate wiring will undoubtedly be prepared to administer swift kicks in the pants to any such gyp artists turning up in their back yards, as is being done in California. But while doing so, and without restraining the force of their kicking, let them say thanks for this left-handed evidence of the success of their promotion.

Inspiration for Lighting Salesmen

The lighting jobs reported in this issue were selected because they clearly illustrate the excellent opportunities for relighting the nation's commercial and industrial facilities. Such relighting offers the greatest opportunity for lighting sales over the next decade. Electrical World is not alone in this belief. Surveys by the National Electrical Manufacturers Association and the Edison Electric Institute confirm it.

Last year Electrical World's special lighting issue (Aug. 10) was devoted to telling how utilities were selling commercial and industrial relighting. This year the stress is placed on selling the benefits of such jobs. For all selling must be in terms of the advantages and benefits to the customer.

These benefits are brought out in the 11 case histories beginning on page 97 (others will appear later). They represent accomplishments of utility lighting engineers, industrial plant engineers, consulting engineers, and manufacturers' lighting engineers. Each installation was a prize winner in a nationwide contest conducted by the Illuminating Engineering Society. And each should be an inspiration to those carrying the burden of relighting commercial and industrial America.

Industry Slogans—An Industry Job

The best, quickest, and easiest way to sell the public on a product or an idea is to use a slogan. This has been recognized for hundreds of years. "God wills it" inspired the crusades. "Remember the Maine" made a nation eager for war. And "99.44% pure" has sold millions of cakes of Ivory soap.

The electric utility industry would do well to devote more study to the creation of industry-wide slogans. To date segments of the industry, especially the individual operating companies, have coined many catchy ones and have used them with great success. Some of these have gained industry-wide acceptance and so have been used throughout the country. But the industry accepted them only after they had been coined. What is needed is industry cooperation in their coining.

When a slogan is required for nationwide use, it might be good practice to set up a group representing all segments of the industry for the sole purpose of devising one. Certainly the industry can afford the little time and money required to provide one of its best public relations tools.

Safety Is Here to Stay—Are You?

The headline on this editorial was one of the prize-winning slogans in a contest sponsored by the Black Hills Power & Light Co, Rapid City, S. D., among its employees. Such contests do much to focus the attention of employees on safety, always a commendable activity. In trying to coin a winning entry, they spend hours, even days, considering all aspects and angles of working safely.

But safety goes far beyond contests and slogans. It is the result of a state of mind brought about by thinking safety, practicing safety, and advocating safety not for a week or a month but all the time. Until all employees gain this state of mind, the industry, through the managements of the many operating companies, must continue its battle so that both safety and the employees are here to stay.

Why TV Sets Have Sold so Fast

The rapid sale of television receivers in the past few years has been attributed to many factors. However most of these factors have been incorrect. TV sets have been selling at such a high rate for one reason only. They have had the advantage of more free demonstrations than any other electric appliance since the radio.

When the Browns get a TV set, all of their neighbors and friends are given an opportunity to see it in action. After spending hours watching the Browns' set, the neighbors and friends are sold on TV. So they go out and buy a set of their own.

The same thing would happen if the Browns would call in their neighbors and friends when they bought their electric blanket, their clothes dryer, or their dishwasher. But they don't. That's one important reason why the sales of these appliances lag far behind those of TV receivers. TV sets have sold so rapidly because they have profited by hours of free demonstrations. Any other appliance will sell just as well if it can get equal hours of free demonstrations.

THE ELECTRICAL WEEK

The Issue's News Highlights . . . Utility company representatives confer with government officials and local conservationists on possibility of partnership development and preservation of resources.

Brig Gen Herbert Vogel, Army Corps of Engineers, is nominated as a member of TVA's board.

New plan to encourage development of utility-size nuclear plants is sketched out by AEC staff . . . Inter-Industry Farm Electric Utilization Council is set up to promote power use in rural areas.

Minneapolis City Council voted 7-5 for an ordinance compelling Northern States Power Co to pay the city $500 a route mile for use of the city's streets for its lines. First payment comes due the second Monday in November; total will be about $546,000 a year. Company plans a legal fight on the ordinance.

Agreement on an 8.35¢ hourly wage increase ended a one-day strike by IBEW-AFL against Kansas City P&L. Missouri Gov Phil M. Donnelly had been prepared to order state seizure of the company to prevent interruption of service, but supervisors kept all plants running.

Two AIEE Presidential Nominees: New York Section proposes Morris D. Hooven, Public Service Electric & Gas Co; and Lehigh Valley Section proposes Walter B. Morton, Pennsylvania Power & Light Co, for the term 1955-56.

First power from the St. Lawrence Project will be on the line by the fall of 1958 and all generators will be handling full load by 1959, J. Burch McMorran, chief engineer of New York State Power Authority, told an audience in Gouverneur, N. Y.

The $67 million Richard L. Hearn steam plant in Toronto, put out of service last April by two explosions, will produce power again this month, Ontario Hydro announced. Engineers who built the plant's four units said the breakdown occurred because the wrong type of steel was used for manufacturing retaining rings.

Sale of 30,000 room coolers will be lost this season in Consolidated Edison (New York) service area alone because of inadequate wiring, a survey of the area's 12 largest installers indicated. Dealers expect to sell 110,000 units, some of which will have to be returned because of the wiring situation.

Britain's Atomic Energy Authority, a new public company free from government controls, took over control of the country's eight atomic plants. Nuclear power for home use is the authority's goal. Its leaders predict the goal will be reached by the end of 1956.

Off the Washington Wire . . . House-Senate differences on the power features of the Atomic Energy Bill were shaping up along these lines as EW went to press:

- AEC will be allowed to go in the power business only to the extent of building demonstration atomic power plants and selling power from them, but other federal agencies such as TVA may apply for licenses to build and operate such plants.
- Public bodies and co-ops will get first call on the power from such plants "where practicable."
- Federal income taxes arising from power supply contracts with AEC are not to be handled in a separate account as proposed in the Dixon-Yates contract.

Still unresolved at midweek was the patenting of basic components for atomic power plants. The House was holding out for normal patenting procedures which would give the inventer a 17-year exclusive hold on the patent. The Senate wanted to require compulsory licensing of basic patents during the next ten years.

Federal power customers in the Missouri River Basin are getting larger amounts of power in renegotiating contracts under the Department of Interior criteria. Average cost of this power to smaller customers is running about seven mills per kwhr in eastern Colorado and southeastern Wyoming.

AEC hopes within the next month to invite lump sum bids for the manufacture of small 1,500-kw atomic power plants suitable for supplying power to remote military installations.

Light's Diamond Jubilee Committee released a 27-minute color film on electrical progress for showing throughout the country by companies participating in the Jubilee. Film, by RKO, is titled, "The Eager Minds."

Georgia PSC froze rates of Georgia Power Co under the March '53 fuel adjustment clause and rejected an application by the company for higher rates.

Cleveland Electric Illuminating received PUC approval to increase rates by $4.2 million a year, effective Feb. 9, 1955.

Public security offerings for the electric industry in the first half of 1954 totaled $1.4 billion as compared with $1 billion in 1953, Reis & Chandler survey shows. Private sales in the six months of 1954 aggregated $109 million as against $190 million in the like 1953 period.

Executive Changes—Northern States Power Co elected H. H. Watson vice president and assistant to the president. His successor as vice president of operation is Earl Ewald, formerly manager of operations.

Utility Men Confer on Conservation

Power company representatives, government officials and other conservationists explore possibilities of partnership development and preservation of natural resources

Recognizing the urgent need for the electric power industry to step up its conservation program to help prevent further diminution of the nation's water supply, representatives of 29 utility companies held a two-day conference, July 28-9 at Dayton, Ohio, with government and other conservationists. Purpose was "to discuss workable community-industry-government partnerships for development and preservation of natural resources, as advocated by the Eisenhower Administration."

The Electric Utilities Conservation Conference was called by a group of area, industrial and land development managers and conservationists of electric companies representing every section of the country. John H. Jones, Monongahela Power Co, Fairmont, W. Va., served as chairman.

The Theme . . . Though the conference centered on partnership with state and federal agencies, the theme became: "Don't run to Washington for money to handle local projects, unless you also want federal control."

Emil Lindseth, acting assistant commissioner of the Bureau of Reclamation stressed this theme when he said that, in his opinion, "only those areas unable to handle their own conservation problems should seek federal aid."

In opening the conference, Jones declared that the utilities are vitally concerned with water supply and river pollution.

"It's a matter of economics with us," he said. "Farms and factories depend upon adequate supplies of good water for their livelihood and we, in turn, are dependent on them for our income."

He and other company participants made it clear that the communities they serve are interested in utilizing to the fullest the services of various state and federal conservation agencies, but without government interference or control.

J. M. Stuart, vice president and associate general manager of Dayton Power & Light Co, which acted as host to the conference, sounded the keynote of the meeting by stressing the serious water shortage and also citing what is being done in the company's service area to alleviate the situation.

"In the Miami Valley, floods are under control," he told the 42 delegates and guests, "but now another problem faces us. It is the same problem that faces most of the nation—water shortage. Again our people in the Valley have met the challenge. Already, we have raised—by public subscription—more than $200,000. The money will be used to make the necessary survey (for a series of headwater lakes) and to prepare an official plan. We expect to pay for the whole job ourselves."

'Healthy Sign' . . . Col John L. Person of the Ohio River Division of the U. S. Army Corps of Engineers, told the group that determination of the Miami Valley citizens to solve their water conservation problems without state or federal aid "is a healthy sign."

O. B. Reemelin, vice president, Dayton P&I, said that population increase and industrial growth have created demands for water which the Miami River, in its present condition, is not capable of satisfying. As chairman of the Dayton Chamber of Commerce and the Miami Valley Water Conservation Committees, he told how the proposed series of headwater lakes would increase the river's flow from 144 sec ft to 500 sec ft.

"This increased river flow," he said, "will cut sewage treatment costs, decrease stream pollution, provide water for industrial expansion and afford increased recreational facilities."

Interview Method . . . Conference was conducted on an interview basis. The speakers had no prepared talks. They were questioned by an electric company representative after which anyone was permitted to question them.

Each of the interviewers developed the "partnership" theme. Based on answers given by state and federal officials, it was the consensus that electric companies and other local groups could work in partnership with governmental agencies under the present Administration's policy in planning and developing water conservation programs, without becoming involved in governmental controls.

MODEL is used by W. J. Harnish, engineer of Miami Conservancy District (at head of model) to explain to a group of electric company representatives how five retarding dams on the Miami and Stillwater Rivers protect residents of the Miami Valley from disastrous floods

NOMINATED as a member of TVA board, Brig Gen Herbert Vogel leaves Capitol after a visit

For TVA: An Army Engineer

Senate Republicans hope to avoid a revival of the bitter public-private power controversy over the confirmation of Brig Gen Herbert D. Vogel to be chairman of the board of the Tennessee Valley Authority.

Now Southwest Division engineer for the Army Corps of Engineers, Vogel was named last week by President Eisenhower to be a member of the TVA board of directors. The White House said Vogel would be designated chairman as soon as he takes office.

TVA area Senators, still licking their wounds from the 13-day battle over TVA power expansion which had been a central issue in the atomic energy debate, hinted that the Vogel confirmation procedure would be no routine matter.

In an interview last week with Capitol Hill reporters, Vogel said he did not believe he could be labeled as either a public or private power advocate. He noted that the Army Engineers try to steer a "middle path" on this issue, judging each case by its merits.

He told reporters he was ready to state without reservation that he believes in "the wisdom and feasibility" of TVA. The TVA act requires that all board members subscribe to this statement of belief. Emphasizing his position in this regard, Vogel added, "I do not subscribe to anything with tongue in cheek."

Vogel appeared to measure up to the legal requirement that TVA officials be appointed on a non-partisan basis. He said he had never registered with either party or voted in party primaries.

He also commented on other issues involving the agency:

- He does not think the Eisenhower Administration is "inimical" to the interests of TVA.
- On expansion of TVA's generating capacity, he said "I must reserve judgement on some things until I can examine them more closely."
- On the proposed Dixon-Yates contract which would bring a big block of privately produced power into the TVA area, Vogel said "that is something for Congress to decide."

Reece Approves . . . Vogel received an endorsement from Republican House member Carroll Reece, whose Tennessee district falls within the TVA area. Reece, former chairman of the GOP National Committee, said the people of the Tennessee Valley are "very fortunate to have Vogel head up the authority."

But there was less enthusiasm from TVA area Senators who will have a vote on Vogel's confirmation. This group, which wants to hear more about Vogel's views during committee sessions, includes Kentucky's John Sherman Cooper, only Republican from the area; Albert Gore (D-Tenn.), and Lister Hill (D-Ala.).

Sen Edward Martin (R-Pa.), chairman of Senate committee which will conduct confirmation hearings, said he anticipated no trouble.

The 53-year-old general is a graduate of West Point. Besides being Southwest Division engineer, he is a member of board of engineers for rivers and harbors and chairman of Arkansas-White-Red River Basins Interagency Committee.

Upon confirmation, Vogel's nine-year term is to begin Sept. 1 after he retires from the Army.

Cabinet Committee Set Up on Energy Resources

Cabinet committee to formulate national policy on energy supplies and resources has been created by President Eisenhower.

Aim of the policy is to strengthen national defense, provide for orderly industrial growth, and assure fuel supplies for an expanding economy and for any future emergency. Among other things, the committee will review factors affecting requirements and supplies of coal, petroleum, natural gas.

The policy committee is headed by Arthur S. Flemming, director of the Office of Defense Mobilization, and consists of the Attorney General and the Secretaries of State, Defense, Interior, Commerce, and Labor.

Kemano Power Flows to Kitimat

Power is now flowing from Kemano powerhouse, built inside a mountain, to an aluminum smelter 50 miles away at Kitimat in British Columbia. Pouring of the first aluminum ingot at Kitimat last week marked completion of the first stage of the vast hydroelectric and aluminum smelter project constructed by Aluminum Co of Canada on the Pacific coastline.

The project was begun three years ago and to date $275 million has been invested in it. First stage of the project now in operation uses 420,000 hp and will produce 91,500 tons of aluminum annually. But eventually the project will develop 2,240,000 hp and produce 550,000 tons of aluminum per year.

The power plant is located in a cavern a quarter of a mile inside Mount DuBose. Three 140,000-hp turbines are driven by water falling 2,600 ft through penstocks from a ten-mile tunnel drilled through coastal mountains.

KEMANO POWERHOUSE as it appeared during final phase of construction. Rotor is being lowered into place

Court Backs TVA

Realty firm's suit to block construction of transmission line is dismissed

A three-judge federal court ruled Aug. 4 against Rainbow Realty Co in a suit which would have blocked construction of a Tennessee Valley Authority transmission line across a 5,000-ft strip of land in Nashville.

The court held that major contentions of the Nashville Realty Company "have long been rejected by the highest court" and granted TVA's motion to dismiss the complaint.

Rainbow had insisted TVA's power system, once predominantly hydroelectric, was being converted into a predominantly "steam power" system.

The firm said TVA lacked statutory or constitutional authority for the construction and operation of such a system or for the construction of transmission lines for marketing the output of such a system.

Construction of transmission lines across its property would be in violation of Davidson County zoning restrictions, the company said.

"There can now be no doubt that there is plainly both constitutional and statutory authority for the acquisition of TVA by eminent domain of easements and rights-of-way for the erection of transmission lines to carry hydroelectric power," the court ruled. "As has been shown, the Congress has lawfully appropriated money for the construction of 'standby' or 'firming up' steam plants as auxiliary to hydroelectric TVA plants."

The transmission line, the court said, would serve Nashville and would be part "of a single integrated system of transmission connecting all the hydroelectric power plants for TVA, together with its steam plants and points of intersection with other utility systems."

The court said a series of Supreme Court decisions held that construction of the transmission line "cannot be held unconstitutional merely because such lines carry steam-generated electricity in addition to hydroelectric power."

It was pointed out that Congress, in 1939, sanctioned an arrangement for power between TVA and Nashville and that an elaborate system of transmission lines serves the city.

EJC Plans Unit to Spur Use of Nuclear Energy

Engineers Joint Council has announced that it plans to form a joint agency of leading engineers to stimulate development of industrial uses of nuclear energy.

The council will invite societies of physicists and chemists to join engineering groups to plan a strong joint agency to develop discussions on nuclear engineering subjects and to publish worthwhile papers and addresses. A national convocation to explore the subject and establish the agency is planned for 1955.

License Sought for Yukon Project

Formal application for a conditional water license in northern British Columbia that would lead eventually to construction of a $700-million B. C.-Yukon hydroelectric and metallurgical development was presented to the provincial government in Victoria, July 26, by officials of Frobisher, Ltd.

Meeting with Premier W. A. C. Bennett and Resources Minister Robert Sommers was Thayer Lindsley, head of Ventures, Ltd, accompanied by about a dozen mining representatives.

Work Could Start in '55 . . . Should both the federal and provincial governments approve the plan this year, construction of a $270-million hydroelectric project and metallurgical industry, with development of 660,000 kw as the initial stage, would begin next year, it was announced.

Planned potential for the completed project is 3,750,000 kw.

Scheduled for immediate construction are two small pilot plant production units in Vancouver, one for production of pig iron and steel, and the other for cobalt-nickel.

The development will be undertaken by Northwest Power Industries, Ltd, a subsidiary of Quebec Metallurgical Industries and Frobisher, Ltd, which in turn are subsidiaries of Ventures, Ltd, holding company for a large number of Canadian mining companies.

Initial plans include an expenditure of about $212 million to divert the headwaters of the Yukon and Alsek rivers by a series of dams and tunnels into the Taku River, and an expenditure of $57 million for construction of smelting and processing plants at the head of the Taku Inlet.

3 Main Dams . . . Water storage will be provided from three main dams, one 4 miles upstream from Whitehorse, another on the Teslin River 40 miles north of Teslin Lake, and the third just below the junction of the Yukon and Big Salmon Rivers.

Two tunnels, the first 1 mile long connecting Atlin Lake with Sloko Lake to the south, and the second 9.7 miles long to connect Sloko Lake to Nakonake River, will convey water from Atlin Lake elevation 2,192 ft to the Nakonake river, creating a drop of 1,092 ft and a potential of 1,950,000 kw.

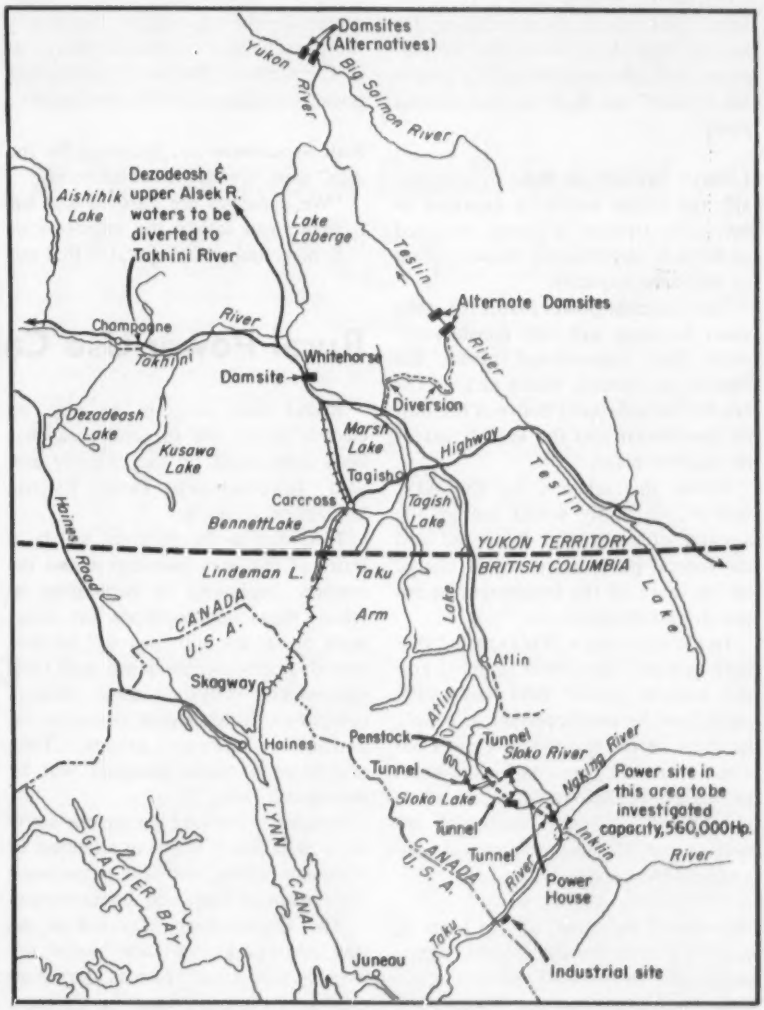
Later, a third tunnel will connect the Nakonake Valley and the Taku River valley to generate 1,125,000 kw, bringing the total to 3,225,000 kw. Power stations will be in the Sloko, Nakonake and Taku valleys and these, with the further possible establishment of a dam on the Taku river itself, brings the total potential to 3,750,000 kw.

A transmission line, 45 miles long, will convey the power from the initial project to the industrial site at the head of Taku Inlet. At first, emphasis will be on production of nickel, cobalt, iron, steel and manganese alloys.

Metal Production . . . Metallurgical objectives are four: Treatment of cobalt-nickel ores and concentrates from New Caledonia, the Philippines, and other Pacific Islands; smelting of Pacific coast iron ores and concentrates for production of pig iron and steel; production of ferro-manganese from ores from southwest Africa; and treatment of zinc concentrates and other base metal concentrates available in British Columbia.

The pilot plant production units in the Vancouver, B. C., area are expected to be in operation by 1957.

By 1962 the company expects to be producing 550 tons of iron and steel daily by electrolytic smelting.



B. C.-YUKON development will consist of dams, powerhouses, industrial plants as shown on map

New Reactor Plan Proposed

AEC staff's scheme to push development of utility-size nuclear power plants calls for U. S. and local partnerships

Brand new "reactor of the year" scheme for spurring development of utility-size nuclear power plants has been sketched out by the staff of the Atomic Energy Commission.

In line with Republican power policy, the scheme calls for a working partnership between the federal government and private industry or public groups.

It would work like this:

In the course of planning for future generation expansion, electric utilities would be encouraged to include a fair-sized nuclear power plant in their systems. The utility would choose the reactor type best suited for its purposes, and submit a partnership proposal to AEC for building the nuclear plant.

Utility's Investment Role . . . Generally the utility would be expected to invest the amount of money required to build a conventional thermal plant of the same capacity.

Since nuclear power plants for some years to come will cost considerably more than conventional plants, the federal government would pick up the tab for the difference between the utility investment and the actual cost of the nuclear plant.

Under this scheme, say the AEC staffers, the utility would acquire the amount of generation it needed and the federal government would charge off its share of the investment to research and development.

In the early years, it is expected that utilities would be slow in stepping into the nuclear power field and AEC would not be overburdened to supply its share of the financing. This is because there are large uncharted areas in reactor technology which are uninviting to utility operations, which are not geared to accumulating sizable amounts of risk capital.

'Reactor of the Year' . . . In years to come a greater number of utility proposals may be expected and AEC must then be more selective. When that time comes, the staffers suggest that AEC then choose each year the most promising proposal as the "reactor of the year." Criteria for this honor would be the promise of the greatest technological advance for the minimum cost to the government.

As nuclear plant costs are brought in line with conventional plant costs, the federal government would step out of the picture.

This scheme was outlined by Dr Lawrence R. Hafstad, director of AEC's Reactor Division at a recent meeting of the Missouri Basin Inter-Agency Committee. He called on committee members to explore thoroughly the potentialities of nuclear energy as a complement to the hydroelectric power being produced in the region.

Staff Spokesman . . . Speaking for the AEC staff, Hafstad went on to say:

"We ourselves are satisfied and believe we can satisfy the engineers of any interested utility operator that nuclear power plants can be confidently expected to work, though there may be some delay and inconvenience in getting the first units up to full power. We are further satisfied that, with a fair price for by-product materials produced, operating revenues will exceed operating costs."

Home Power Plant . . . This AEC staff approach to economical nuclear power was miles away from the suggestion of Democratic Sen Edwin C. Johnson of Colorado that storage battery-size home nuclear power plants are just around the corner. Johnson, a member of the Joint Congressional Committee on Atomic Energy, saw the home power plants as a posisbility in the near future.

However, AEC experts well acquainted with the agency's research activities put little credence in the Johnson predictions. They knew of no government research projects which would justify Johnson's optimism about such a development.

The home power plant was not mentioned in the $100-million reactor development program which has been approved by the Congressional committee of which Johnson is a member.

Rural Power-Use Campaign Is Launched

Brand new program to step up electric power use in rural areas has been announced by the recently created Inter-Industry Farm Electric Utilization Council.

First step in the program will be a series of five area meetings across the country beginning in September at which plans and methods for statewide power-use activities will be presented to electric appliance and farm equipment manufacturers, electric companies, rural electric cooperatives, and other interested groups. Time and place of these meetings will be announced later.

Besides promoting power-use activities, the council is giving attention to adequate wiring and will stress need for improved farm and home wiring.

The Inter-Industry Council is the outgrowth of a temporary "power use steering committee" formed during an electric sales conference in Chicago, March 11. Both the council and the former committee is backed by Rural Electrification Administration.

Council Members . . . Support for the council power-use program has been pledged by several national organizations representing the industries involved. Council members are:

Representing electric companies: E. W. McClure, Kansas Power & Light Co and C. V. Sorenson, Indiana & Michigan Electric Co.

Representing rural electric co-ops: J. K. Smith, Kentucky Association of Rural Electric Cooperatives and Oliver Kimbrough, Farmers Electric Cooperative, New Mexico.

Representing the electric manufacturing industry through the National Electric Manufacturers Association: W. E. Saylor, Kelvinator Division, American Motors Corp, and Walter Hemker, Westinghouse Electric Corp.

Chairman is Fred H. Strong, Deputy REA Administrator.

In Georgia: Dam Delayed by the Depression Is Officially Dedicated

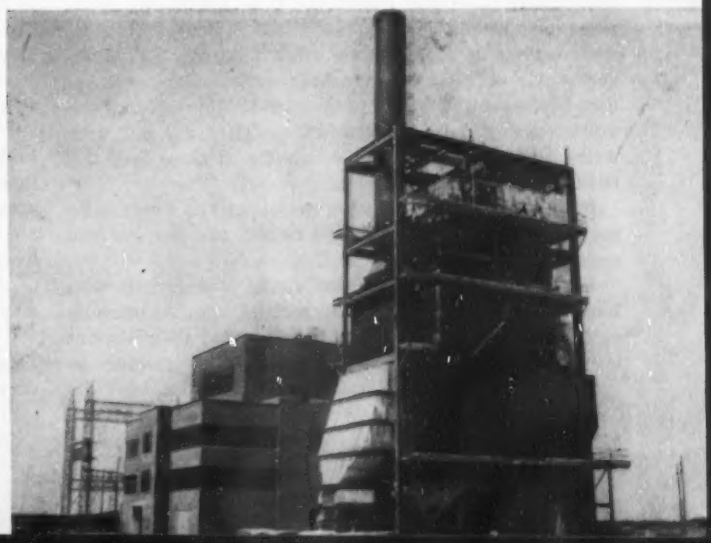
Georgia Power Co's $14-million, 45,000-kw Sinclair Dam (above) on the Oconee River near Milledgeville got its official dedication late last month after nearly 25 years of starts and stops. Started back in 1929, work was halted by the depression and not resumed until 1949.

In true southern style, dedication was marked by an old-fashioned pit-cooked Georgia barbecue and political oratory. Gov Herman Talmadge called the dam "another milestone in Georgia's progress." And Rep Carl Vinson praised construction of the project without use of government funds.

Talmadge also eulogized Georgia Power's Benjamin W. Sinclair for whom structure is named. Sinclair, production manager who has just retired after 42 years of service, is shown (left) at dedication ceremonies receiving greetings from Southern Co Pres C. B. McManus as Mrs Sinclair looks on.

In Texas: New Steam Plant Helps Ease Heat Wave

Southwestern Gas & Electric Co's new 50,000-kw Lone Star plant, located at Lone Star, Tex., is helping the utility to meet record loads caused by an unprecedented heat wave which began in June. Company's peak load has reached 315,000 kw, the peak expected in 1955. The plant, which went on the line in April, was formally dedicated June 12.



WASHINGTON COMMENT

JESSE MOCK

While the bitter public-private power debate raged in the Senate over the Atomic Energy Bill, the House quietly scuttled a key portion of the Administration's reclamation-power program.

House Helps Eisenhower Out Of the Fryingpan

The House action will likely have more immediate effect on federal power development activities than the much-publicized atomic power measure. For the Administration, which was out to make a reclamation record for itself, the House move was a significant setback.

Turndown came on the authorization of the $173 million Fryingpan-Arkansas reclamation-power project which the Administration has been pushing since June of last year. The development was to be built on the continental divide in Colorado to divert Colorado River water into the Arkansas River. Besides developing nearly 100,000 kw of power, the project would also have provided irrigation, reclamation and municipal water supply benefits.

Electric companies in the area offered no opposition to the project since the power marketing methods were not in dispute. Chief support came from farmers and civic organizations which would have directly benefited from the project.

Senate Said Yes . . . In the Senate the authorization bill sailed through on a unanimous consent motion. The measure was reported out of the House Interior Committee with a strong minority dissent on its merits.

But when the time came to bring it up for floor debate, opponents hopped on the measure with both feet. Harping mainly on the financial aspects of the project, they succeeded in sidetracking the bill even before it was brought up for general debate. The vote was 196 to 188 —a count that will be remembered for some time to come. Had the vote come on the merits of the bill, observers believe the defeat would have been more overwhelming.

As it is, the action has likely headed off any final House consideration of the billion-dollar Upper Colorado reclamation-power project which the Administration also had relied on to make a reclamation record attractive to western voters. The proposed Upper Colorado project would have developed more than 1 million kw of power when completed.

In neither of these authorization bills did the public-versus-private power controversy arise. Opponents of the Fryingpan-Arkansas project were the downstream water-users in Southern California. They did not want water diverted from the Colorado River, since they will need it for their own purposes.

It is this bitter feud between the upper and lower basin people that now threatens to be carried to other Western reclamation measures.

Formerly the Westerners had freely traded votes with Easterners to gain support for reclamation. As recently as the present Congress, it was understood that Western lawmakers had gone along with the Administration on such measures as the St. Lawrence Seaway and the Tidelands in return for Eastern support on Fryingpan-Arkansas and Upper Colorado reclamation-power projects.

Eastern Support Withheld . . . When the upper and lower basin factions split, this gave the Easterners the opportunity they were looking for to withhold support for the two big reclamation power projects. Thus the old East-West coalition was temporarily and perhaps permanently smashed.

New Deal Democrats were pleased to see the split. It gave them the opportunity to vote down the Eisenhower Administration's first attempt at writing a reclamation-power record.

Even before the Fryingpan-Arkansas showdown, the reclamation program had been getting a little wobbly because many of the best projects have been completed and the more questionable have been brought up.

Breakup of the East-West coalition on the Colorado projects doesn't mean that all reclamation projects are washed up. Two days after voting down Fryingpan, the House by a close margin approved authorization of the Talent Division Project on the Rogue River in Oregon.

But wherever the Westerners split on the big reclamation-power projects, they do so with full warning that those projects will be voted down. The coalition that held firm over the years is wearing thin.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Rain does not follow the plow nor does condensing water follow the power plant.

Zirconium available in 1945 totaled less than 100 lb, and it was worth $300 per lb. The atomic program could advantageously use 150,000 lb. in 1954.

Non-destructive test to evaluate strength of timber with knots and other natural characteristics would be beneficial.

Embrittled insulation cannot withstand the mechanical shock imposed by surges. Embrittlement results from the attack of peroxides on the cellulose of cotton and paper.

Rectangular wave-guide loss at 5,000 mc is around 1 db per 100 ft, at 10,000 mc around 3 db, and at 30,000 mc in excess of 10 db.

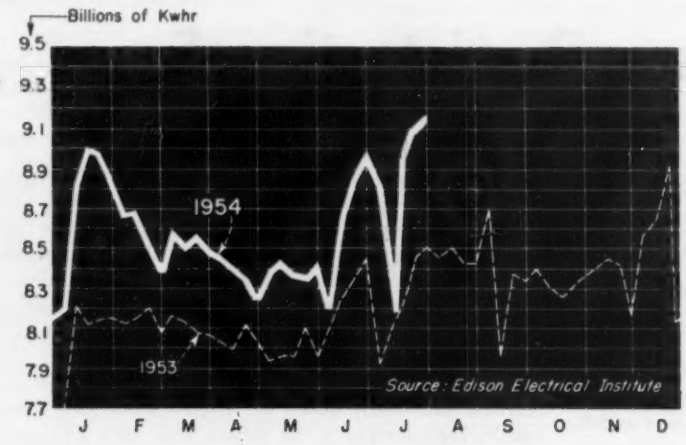
Leaks in nitrogen-filled HV cable as small as 1 psi per month can be found by contaminating the gas with 1% Freon and using a halogen detector to detect the Freon.

Moist soil may be expected to deliver heat for air conditioning at a rate of 40-50 Btu per hr per ft of length for periods of short duration and 20-30 for an entire season.

Blue print checking before energizing new equipment is wisdom because discovery of errors at the last minute may cause delay in energizing a whole plant.

Tellerium added to cable-sheath lead imparts high creep-strength without sacrifice in bending life and ductility.

STATISTICS



Output Week Ended July 31—9,139,000,000 Kwhr

Seasonally Adjusted Index†—177.7

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
July 31	+7.4	+0.8	+2.4	−3.0	+6.3	+16.4	+20.5	+6.0	+2.1	+7.1
July 24	+7.6	0.0	−1.7	−2.1	+14.3	+18.6	+23.8	+3.4	+1.6	+4.2
July 17	+9.0	−0.2	−0.3	−1.6	+16.1	+20.7	+28.7	+6.1	+3.4	+3.8

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load‡ (Million Kw)	May	73.8	73.7	70.7
Capacity (Million Kw)	June	95.31	93.81	85.06
Production (Billion Kwhr)	May	37.43	36.84	36.02
Hydro	May	10.35	9.91	10.29
Fuel	May	27.08	26.93	25.73
Fuel Consumption				
Coal (Million Tons)	May	8.67	8.68	8.59
Oil (Million Barrels)	May	4.25	4.78	6.08
Gas (Billion Cu Ft)	May	94.70	91.10	87.72
Sales (Billion Kwhr)	May	31.59	32.31	31.32
Residential	May	9.31	9.93	8.50
Commercial	May	5.62	5.62	5.18
Industrial	May	14.43	14.60	15.49
Other	May	2.23	2.17	2.16
Net Income Class A & B Companies ($ Million)	May	85.46	96.05	82.58
Estimated Dec. '54 Peak ‡(Million Kw)	May	88.1	88.4	91.8
Kwhr per Residential Customer (12 Month Average)	Apr.	2,415	2,398	2,226
Revenue per Kwhr Residential Service (12 Month Average)	Apr.	2.72¢	2.72¢	2.76¢
Canadian Production (Billion Kwhr)	May	5.93	5.65	5.76

Business Statistics

FRB Industrial Production Index†	June	124*	123	136
Gross National Product Annual Rate ($ Billion)	1st Qtr.	355.8	360.5	361.8
EW 4 Industry Production Index†	May	114.9	114.6**	126.2
ENR Construction Cost Index††	July	135.0	130.5	126.6
BLS Consumer's Price Index	June	115.1	115.0	114.5
NEMA Insulation Materials Sales Index†	May	116	124	174
NEMA Electric Appliance Sales Index†	May	88	96	108
NEMA Household Refrig. Sales Index†	May	74	73	81
Metal Prices (Aug. 3)				
Copper, Conn., V., lb		$.30	.29½	.29¾
Lead, N. Y., lb		.14	.14	.14
Zinc, prime Western S. St. Louis, lb		.11	.11	.11
Tin, Straits, qual. N. Y. lb		.95	.96¾	.78¼
Aluminum, ingot, base price		.21½	.21½	.21½
Nickel, base price		.60	.60	.60
Steel, billets, Pitts., ton		64.00	64.00	62.00
Steel, scrap, No. 1 heavy, Pitts., ton		28.00	29.00	44.00

*Preliminary **Revised ‡Class 1 Systems †1947-49=100 ††1949=100

Monthly Residential Bills Edge Up Again in '53

Today's housewives pay an average monthly bill of $7.10 to cover the use of electricity for lighting, refrigeration, cooking, and various small appliances in the home. This is the nation-wide average for 250 kwhr usage based on the Federal Power Commission's study of typical residential bills of cities of 2,500 population and more.

The 1954 amount is just 2¢ higher than last year, and marks a continuation of a slight upward trend since 1951. The trend is a reflection of moderate rate increases which have generally been in evidence since then, but have been offset, in part, by rate decreases in heavily populated areas. Last year, there were average rate increase in 20 states as against decreases in 16 states, with the remaining 12 reporting no change. The current figure is still well below the $8.91 average reported some two decades ago.

For cities with 50,000 or more population, the five states with the lowest 250 kwhr-bill were Washington, California, Illinois, Wisconsin, and Kansas. Those with the highest were Massachusetts, Florida, Iowa, Rhode Island, and Pennsylvania. Fifteen states had an average bill of more than $7.50 while nine had an average under $6.50.

Typical bills for some of the larger cities appear in the accompanying table, and show a range from $3.20 in Tacoma to $9.51 in Boston.

Residential Bill—250 Kwhr

	1954
Atlanta	$6.13
Baltimore	7.45
Boston	9.51
Chicago	6.35
Cincinnati	6.54
Dallas	6.86
Denver	6.00
Detroit	7.74
Houston	5.58
Los Angeles	4.90
Miami	7.92
New Orleans	6.83
New York	8.38
Philadelphia	6.48
Salt Lake City	6.68
San Francisco	6.44
Tacoma	3.20

SEC Adopts New Registration Form

- **Known as S-9, it is expected to simplify registration, cut waiting period prior to sale**
- **Application will be used for registering nonconvertible fixed interest debt securities.**

The Securities and Exchange Commission has adopted a new form for registration of certain debt securities under the Securities and Exchange Act of 1933. Known as S-9, the new form is a simplication of existing registration forms and already has been used by three corporate issuers. The expectation is that use of S-9 will simplify registration and also cut down on waiting period required until securities can actually be offered for sale.

The new form is to be used for registration of nonconvertible fixed interest debt securities. Any American or Canadian company can use the S-9 if it has been in business at least ten years, has an earnings history which meets the requirements of the form and files regular reports with SEC under the 1934 Securities Exchange Act.

SEC announced consideration of the new form May 27. Since that time, various comments and suggestions from business have been under study in the drafting of the final form.

The idea behind the simplification is that the general registration form, which still must be used by companies which do not qualify for S-9, was too complex and detailed to be of much practical value. Much of the detailed information required on the general form is not significant to the institutional investors which are the primary market for such debt securities. SEC's theory is that such buyers are well aware of the senior position of the securities, the history of the issuer, and earnings coverages anyway.

S-9 Will Have 5 Informational Items

As adopted, S-9 reduces the informational requirements, in effect, to five items:

- Financial statements of the issues, consisting primarily of a five-year summary of earnings and surplus and a balance sheet;
- A brief description of present business;
- Description of the use of the proceeds derived from the financing;
- Description of the securities being issued; and
- Offering price information.

SEC expects prospectuses and registration statements on the new form will be substantially shorter than before, making it easier for the issuing company to prepare and for SEC to process. SEC thus will be able to grant requests to shorten the waiting period between filing and effective dates of registrations. Statutory waiting period after filing until issuer can sell is 20 days, but the law grants the commission discretion to shorten that time.

S-9 does not require filing or distribution of identifying statements during the normal waiting period. But SEC will continue to require, as a condition to cutting this time down, the distribution of so-called "red herring" prospectuses during the accelerated waiting period to each underwriter and dealer expected to participate in the distribution. This is to assure reasonable dissemination of information about the proposed offering.

Proof that a reform of this kind was both desired and practical has already shown up. United States Steel Corp, anticipating adoption of the revised form, filed a registration of $300-million worth of debentures with SEC on the basis of the proposed form on July 12. SEC approved the new form July 21, and U. S. Steel's registration became effective July 28.

SEC experts hailed the prospectus U. S. Steel filed as "classic clarity and simplicity." Just recently two more companies filed registrations, using the new form. Southern California Edison Co filed registration of $30 million of mortgage bonds, due 1979, and the Southern Bell Telephone & Telegraph Co filed registration of $55 million of 35-year debentures.

$18 Million Bond Issue Sold by Northwest PUD

Snohomish County, Wash., Public Utility District has sold a $18,527,000 bond issue at par to Foster & Marshall, Seattle investment bankers. Effective interest rate to the PUD will be 2.36% which is .91% better than on existing bonds.

The proposal was made by Foster & Marshall for a syndicate including Blyth & Co, Inc, Seattle; F. S. Smithers & Co, New York; and the Chicago firms of A. C. Allyn & Co, Inc, Blair, Rollins & Co, Inc, and Central Republic Co.

Proceeds of this new issue, along with $260,000 bonds now owned by the PUD, will be used to retire $18,787,000 in bonds outstanding as of Sept 1, 1954. Terms of the new issue call for a smaller mandatory bond reserve fund. They also provide more lenient conditions for future refunding and accelerated debt retirements.

Bonds in the new issue maturing 1955-62 bear a 2% coupon interest rate; those maturing 1963-68, 2¼%; and those maturing 1969-75, 2½%. Total interest to be paid to Sept. 1, 1975, maturity date of new issue, is $5,144,122.50. Interest on existing bonds maturing Aug. 1, 1984, totals $10,620,903. After paying a call premium of $657,000, net interest savings to the PUD will total $4,819,235.50.

Georgia P&L Hearing on Rates Postponed

Georgia's Public Service Commission has postponed until Sept. 16 its hearing on rate increases for Georgia Power & Light Co. The hearing had been set for Aug. 16.

Commission Chairman Matt L. McWhorter said the change in the hearing schedule was made at the request of Roy Harris, counsel for a citizen's group in Waycross, Ga.

The commission will ask the company to show cause at the September hearing why it should not buy its power from the Georgia Power Co instead of from the Florida Power Co, its parent firm. The commission contends that power costs in the south Georgia area served by GP&L could be cut if the company made its purchases through Georgia Power Co.

A rate increase approximating $128,000 annually was granted last October to GP&L. The increase was to have remained in force only six months, but has been continued by court order.

FINANCIAL BRIEFS

General Public Utilities Corp has announced that the offering to common stockholders of record June 2 of about 111,000 shares to round out their holdings at the market price resulted in orders in excess of this number. Therefore, certain orders will be reduced by allocation, GPU said.

Kalamazoo, Mich., citizens will vote November 2 on whether or not the city should dispose of its municipal electric plant.

Upper Peninsula Power Co has received Michigan Public Service Commission approval to sell 700 shares of $100 par value preferred stock.

Waterville, O., Village Council has heard the first reading of an ordinance which proposes the sale of the community's power system. Ordinance provides for selling all transmission lines and generating equipment to the highest bidder. Power plant building and the section of ground it occupies would be leased up to a maximum of four years.

Today in Utility Finance

YIELDS (%)

Quality	Bonds 1st	Bonds 2nd	Bonds 3rd	Preferred Stocks 1st	Preferred Stocks 2nd	Preferred Stocks 3rd	Common Stocks 1st	Common Stocks 2nd	Common Stocks 3rd
DATE									
July 29	**2.87**	**2.90**	**3.16**	**3.98**	**4.09**	**4.43**	**4.43**	**4.72**	**5.13**
July 22	2.87	2.92	3.16	3.99	4.10	4.44	4.49	4.75	5.18
END OF QTR.									
2nd 1954	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
1st 1954	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Central Illinois Light	12	June	$3,384,146	$3,404,746	$2.88(a)	$3.23(a)
Consumers Power	12	June	25,963,513	22,186,045	3.02(b)	2.77(b)
Florida Power & Light	12	June	9,350,302	7,869,961	3.41	2.90
Kansas City Power & Light	12	June	6,448,329	6,204,286	2.11(c)	2.27(c)
Long Island Lighting	12	June	8,621,132	7,041,224	1.31(f)	1.28(f)
Middle South Utilities, consolidated	12	June	13,964,753	12,795,265	1.96	1.80
Montana Power and subsidiaries	12	June	7,514,238	7,934,239	2.63	2.81
Niagara Mohawk Power and subsidiaries	12	June	26,579,298	25,107,733	2.04(g)	2.01(g)
Ohio Edison and subsidiary	12	June	19,664,678	17,848,140	2.91(h)	2.93(h)
Pennsylvania Power	12	June	2,551,554	2,281,641	....	....
Southern Indiana Gas & Electric	12	June	2,270,245	2,040,674	2.03(i)	2.04(i)
Southwestern Gas & Electric	12	June	4,362,830	3,922,313	....	....
Toledo Edison	12	June	5,377,346	5,270,171	.94	.92
Tucson Gas, Electric Light & Power	12	June	1,647,220	1,501,908	1.48	1.38
Virginia Electric & Power	12	June	14,394,581	12,171,328	2.02	1.82
			1953	**1952**	**1953**	**1952**
Public Utility District No. 1 of Snohomish County, Wash.	12	Dec.	$1,418,816	$1,231,956	....	....

Notes—The figures for the last company have been audited. (a) Based on 1,000,000 shares in 1954 and 900,000 shares in 1953; (b) Based on 7,473,798 shares in 1954 and 6,794,362 shares in 1953; (c) Based on 2,450,000 shares in 1954 and 2,224,540 shares in 1954; (f) Based on average number of shares outstanding; (g) Based on 11,556,036 shares in 1954 and 11,056,036 shares in 1953; (h) Based on 5,806,136 shares in 1954 and 5,278,306 shares in 1953; (i) Based on 913,333 shares in 1954 and 799,167 shares in 1953; and (j) Based on 5,999,980 shares in 1954 and 5,441,034 shares in 1953.

FINANCIAL

Company and Description	Amount Offering ($000)	Offering Price	Yield to Public
WEEK OF JULY 29—AUGUST 4			
None			
SCHEDULED FOR AUGUST—SEPTEMBER—OCTOBER			
Bonds			**Bid Date**
Pacific Power & Light—1st mtg due 1984	$30,000	.....	Aug. 9
Consumers Public Power District, Neb.—western system revenue bonds due 1956–80	2,250	.....	Aug. 12
Manitowoc, Wis.—electric revenues due 1955–74	1,250	.....	Aug. 16
New Jersey Power & Light—1st mtg due 1984	8,700	.....	Aug. 17
Southern California Edison—1st mtg	30,000	.....	Aug. 18
Niagara Mohawk Power—1st mtg due 1984	25,000	.....	Aug. 24
Arkansas Power & Light—1st mtg due 1984	7,500	.....	Aug. 24
Los Angeles, Calif., Department of Water & Power—electric revenues due 1955–84	19,500	.....	Sept. 8
Northern States Power (Minn.)—1st mtg due 1984	20,000	.....	Sept. 28
Public Service Co of Colorado—1st mtg due 1984	20,000	.....	Oct. 4
Indiana & Michigan Electric—1st mtg	16,500	.....	Oct. 5
Wisconsin Power & Light—1st mtg	18,000	.....	Oct. 5
Preferred Stock			
Southern Colorado Power—30,000 sh 4.72% $50 par	$1,500	.....	Aug. 10(f)
Northern States Power—200,000 sh $100 par	20,000	.....	Aug. 24
Oklahoma Gas & Electric—75,000 sh $100 par	7,500	.....	Sept. 14
Tampa Electric—50,000 sh $100 par	5,000	.....	Sept. 21
Indiana & Michigan Electric—40,000 sh $100 par	4,000	.....	Oct. 5
Atlantic City Electric—72,000 sh $100 par	7,200	.....	.....(g)
Common Stock			
California Electric Power—170,000 sh	.....	.....	Aug. 31
San Diego Gas & Electric—800,000 sh	.....	.....	.....
ISSUES RECENTLY POSTPONED			
Bonds			
Gulf States Utilities—1st mtg due 1984	$24,000	.....	.....
Consolidated Edison Co of N. Y.—1st mtg due 1984	50,000	.....	.....
Preferred Stock			
Missouri Public Service—50,000 sh $100 par	$5,000	.....	.....(a)
California Electric Power—105,000 sh $50 par	5,250	.....	.....(b)
Gulf States Utilities—160,000 sh $100 par	16,000	.....	.....

Notes—(a) Postponed indefinitely; Kidder Peabody & Co, underwriters; (b) Temporarily postponed; Merrill Lynch, Pierce, Fenner & Beane group, underwriters; (f) Stone & Webster Securities Corp group, underwriters, and (g) Probably be sold privately through Union Securities Corp group.

Thermal

A. F. PHILLIPS, Supt. of Tests,
Duquesne Light Co., Pittsburgh, Pa.

Transformer Bank Ratings Boosted 398 Mva

No. of Banks in Substa.	Total Nameplate Mva	Total Mva Rating of Banks Prior to 1939, Original Method	End of 1953, Thermal Method	Estimated Future, Thermal Method
One.....	202	200 (100%)	239 (118%)	283 (140%)
Two*....	592	411 (70%)	530 (90%)	562 (95%)
Three*...	564	516 (92%)	626 (111%)	680 (120%)
All.....	1,358	1,127 (83%)	1,395 (103%)	1,525 (113%)

* Assumed that load must be carried with largest bank out of service.
Figures in parenthesis are percent of nameplate capacity.

Thermal rating of distribution substations has saved Duquesne Light Co over $11 million since 1939. Assigned capabilities have been boosted 24% overall, and emergency ratings up to 200% of nameplate have been justified. Another 10% increase is expected as a result of continuing investigations.

These higher ratings have been secured without sacrifice in service continuity or damage to equipment. They have been achieved by proper use of these five factors:

1. Lower ambient air temperatures.
2. Favorable load cycle operation.
3. Forced-air cooling with portable fans.
4. Higher emergency operating temperatures.
5. Emergency load transfer to other stations.

Reserve Capacity . . . Normal practice is to use only four of these factors, holding the fifth in reserve for unpredicted growth or construction delays. This reserve also facilitates procuring equipment outages for maintenance during regular working hours. Load transfer is the reserve for large distribution stations, and a portable substation for smaller ones. Forced air cooling serves a similar purpose in large transmission substations.

Thermal methods have raised the rated capability of distribution and transmission substations to 1,395 Mva from the prior total of 1,127 Mva. This 268 Mva gain is the reward for 15 years of detailed investigations and an intensive program to remedy limiting components. Among the deficient items were no-load tap changers, bushings, terminals, other auxiliary equipment.

Continuation of this program is expected to eke out another 10% in rated capability. This work will be done, of course, only as loads require capacity increase. But the expected 130 Mva of additional capability will boost estimated savings to $17 million for the substation transformers now in service.

Basis for Thermal Ratings . . . Aim of thermal rating is to use transformer capability to the temperature limit set by aging of class A insulation. Reports indicate that insulation life varies as an exponential function of temperature. Particularly helpful are AIEE reports by its Committee on Electrical Machinery, a.so by T. W. Dakin and by F. M. Clark. The latter indicates that every 8 degrees of rise doubles the aging rate at temperatures over 110 C. Below 110 C, doubling may occur for a temperature increment as little as 4 degrees.

Permissible Temperatures Limit Operation

Operation	Hottest Spot	Top-Oil Temperature Free Breathing	Top-Oil Temperature Protected
Normal.....	95 to 105 C	75 C	85 C
Maintenance....	105 C	75 C	85 C
Emergency.....	120 C	90 C	95 to 100 C
Short Emergency	125 C	90 C	95 to 100 C

Instructions Guide Substation Operator

Load Current	Typical Max. Top-Oil Temp. Normal Oper. (95 C H.S.)	Maint. Oper. (105 C H.S.)	Emer. Oper. (120 C H.S.)
100%	75 C	85 C	100 C
125%	66 C	76 C	91 C
150%	57 C	67 C	82 C
175%		56 C	71 C
200%			59 C

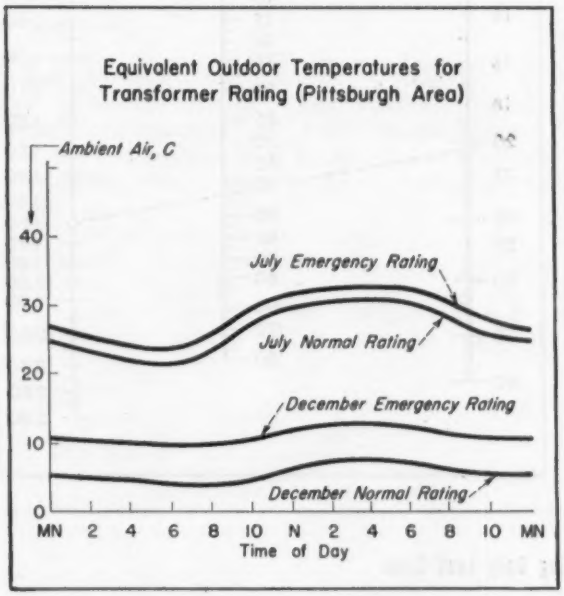
Actual transformer life is hard to determine by such test data, but they do measure the effect of various operating conditions. At 80C the insulation life is computed upwards of 4,000 years; so economic utilization justifies a considerable increase. If temperature is boosted to 150 C, life is cut to about two weeks. Values must be selected between these extremes for normal and emergency operation such that optimum use is achieved without severe sacrifice of equipment life.

Equivalent Air Temperature . . . Starting point for thermal loading is the ambient air temperature. Averaged values from weather data are not satisfactory because insulation aging is an exponential function. But statistical analysis of these data produces representative equivalent ambient temperatures which are applied for normal load operation to assure normal transformer life.

Emergency loading arises from the failure of other equipment or lines. Probability theory indicates that the ambient air temperature for such infrequent periods should be assumed somewhat higher than for normal operation. Values selected give a probability of 85 to 15 that expected

Studies Boost Substation Ratings

Proper application of ambient temperature, load cycle, portable fans, higher emergency temperature limits, and prearranged transfer of load boosts distribution substation capability 24% and saves $11 million.



aging rate will not be exceeded, and maximum deviation will not exceed four times this rate.

Equivalent temperature curves shown for the Pittsburgh area are based on weather data showing 24C average daily temperature in July and 1C in December. Averages of daily maximum temperature are 29C and 5C, respectively. Relationship shown between equivalent ambient and Weather Bureau data probably holds for other areas. A 1943 AIEE paper by W. C. Sealey includes a survey of equivalent ambient temperatures.

Daily Load Cycles . . . Convenient alignment charts and heating and cooling curves facilitate quick analysis of load cycles. Calculations are simplified by computing temperature rise in three parts, viz:

1. Top oil rise from core loss.
2. Top oil rise from copper loss.
3. Hottest spot gradient.

Adding these three increments determines the hottest-spot temperature rise with satisfactory accuracy.

Lower ambient temperatures after dark add capability to transformers serving evening peaks. This increment is important in the warm summer months, less so during the winter.

Forced Air Cooling . . . Best method for determining the capability increment for forced-air cooling is to field test the particular transformer under heavy load conditions. At two or three-bank stations this is done by cutting out one bank to overload the remaining bank or banks. A single test at a peak of 140 to 180% of nameplate provides a reference point for calculating any required condition. Curves used to calculate ratings also determine the new reference top oil rise.

Estimates can be made for the increased cooling effect, or arbitrary percentage factors can be applied to the nameplate rating. But the accuracy is not so good, particularly for transformers not originally purchased as forced-air units. Field tests have the added advantage of disclosing hot terminals, defective disconnecting switches, and reversed or faulty fan operations. At times instrumentation and relay settings have proved inadequate, or proposed operating set-ups are found to cause undesirable load distribution.

Higher Emergency Temperatures . . . The hottest spot temperature permitted during emergency varies somewhat with the duration of the overload. For one or two-day operation 120 C is permitted. For short overloads of the order of a few hours, 125C is allowed. Permissible oil temperatures vary somewhat with the means provided to exclude air. In general, sealed-tank transformers tolerate top oil temperatures 10C hotter than free breathing transformers.

Load factor also affects the choice of the hottest spot temperature for normal operation. Below 70% load factor 105C is permitted; whereas temperature is limited to 95C for continuous loads.

Field forces are advised of the permissible temperatures for each transformer, all of which have maximum indicating oil thermometers. Load ammeter scales are marked with the summer and winter normal ratings, or tags are used for the purpose. Supplemental charts tell operators what oil temperature can be tolerated during overload operation without exceeding the allowable hottest-spot winding limit. Charts are obtained by subtracting hot spot gradients from permissible hot spot temperature to determine top oil limits for various loads. These data enable operators to appraise the seriousness of an emergency and

Chart 2—Top Oil Rise from Load Loss

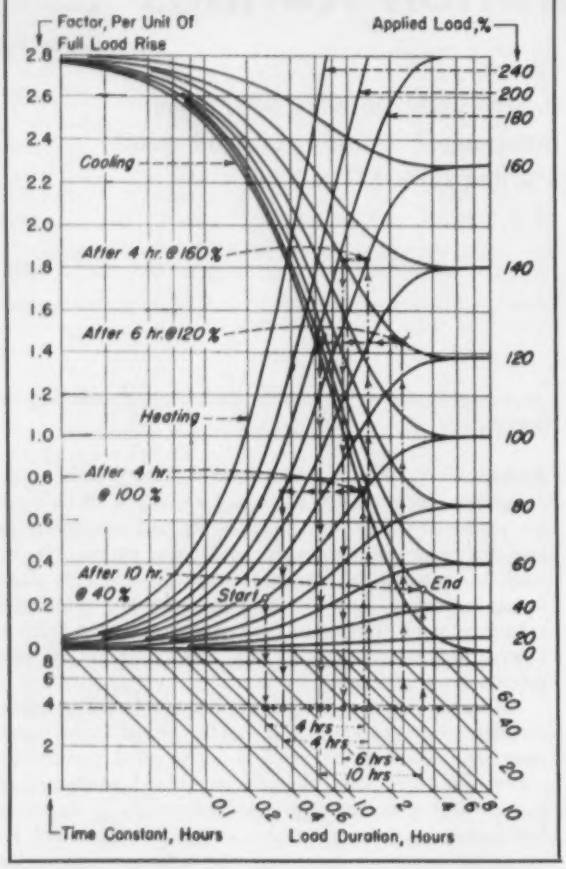
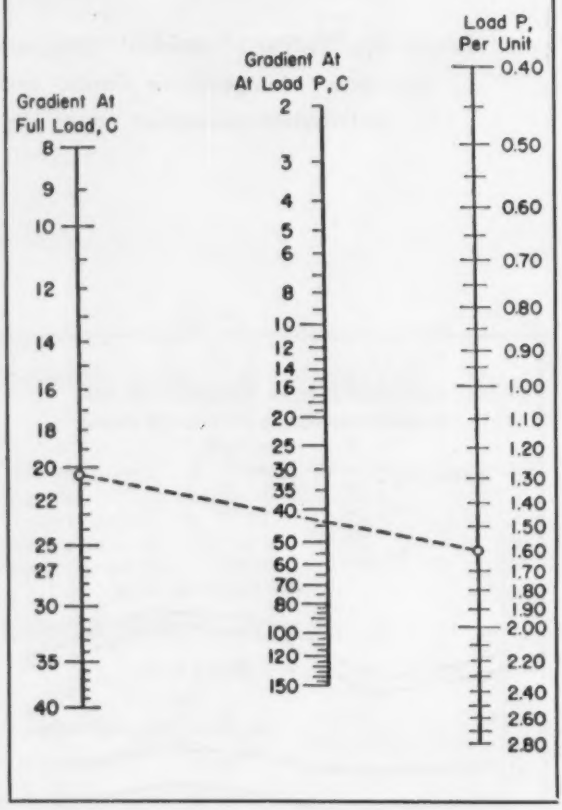


Chart 3—Hottest Spot Temperature Gradient Over Top Oil



Charts Facilitate Computation of Hottest-Spot Temperature During Daily Load Cycle

1. Load loss at full load					7,214 w
2. Core loss at operating voltage					5,050 w
3. Ratio of losses					1.43
4. Top oil rise at full load					44.1 C
5. Top oil rise from core loss (Chart 1)					21.8 C
6. Thermal capacity core & coils, 2,520 lb @ 0.0583 = 147					
7. Thermal capacity case, 3,280 lb @ 0.0391 = 128					
8. Thermal capacity oil, 695 gal @ 1.33 = 930					
9. Total thermal capacity					1,205
10. Top oil rise from load loss (line 4 − line 5)					22.3 C
11. Reference time constant $\left(\frac{\text{line 9} \times \text{line 10}}{\text{line 1}}\right)$					3.8 hr
12. Load	40%	100%	160%	120%	40%
13. Duration	Initial	4 hr	4 hr	6 hr	10 hr
14. Time scale, Chart 2		1.0 to 5.0	1.4 to 5.4	3.5 to 9.5	2.5 to 12.5
15. Oil temp. factor	0.24	0.24 to 0.76	0.76 to 1.84	1.84 to 1.44	1.44 to 0.28
16. Max. top oil rise from load (line 15 × line 10)					41.0 C
17. Max. top oil rise, total (line 16 + line 5)					62.8 C
18. Average copper rise at full load					54.5 C
19. Hottest-spot gradient over top oil (line 18 − line 4 + 10 assumed)					20.4 C
20. Hottest-spot gradient at max. load (Chart 3)					43.0 C
21. Hottest-spot temp. rise at max. load, (line 20 + line 17)					105.8 C
22. Ambient temp. at time of max. load					9.0 C
23. Hottest-spot temp. at max. load, (line 22 + line 21)					114.8 C

to estimate how soon load relief or supplementary cooling is required.

Load Transfer . . . Relief for large transmission substations can usually be achieved by load transfer within 30 minutes. This factor is one of the four used in up-rating these stations, with forced-air cooling held as reserve. Transfer time may approximate two hours for smaller stations where load transfer is usually considered reserve.

Vast savings in investment and important savings from using inherent thermal reserve to permit maintenance during normal working hours adequately justify the effort required. The ratio of peak load to nameplate capacity of all substation transformers, including spares, installed on the Duquesne Light Co system has been raised to about 90%. Before the program was inaugurated in 1939, the loading ratio was only 60.6%. During this period there has been no indication of increase in the transformer winding failure rate.

Graphical Methods Guide Ratings . . . Assignment of proper transformer operating ratings is facilitated by development of graphical methods. Key to this simplification is the fact that hottest-spot temperature rise of a transformer can be computed with satisfactory accuracy as the sum of

1. Top oil rise from core loss.
2. Top oil rise from copper loss.
3. Hottest-spot gradient.

First of these is established from readily known terms without involving load and time. Equation for it is:

$$\Theta_o = \frac{\Theta_{FL}}{(N+1)^x}$$

where Θ_{FL} = full load oil temperature rise.
N = ratio of load to no load losses.
x = constant for transformer type (0.8 for self-cooled is fairly accurate for forced air units)

This equation is plotted as Chart 1.

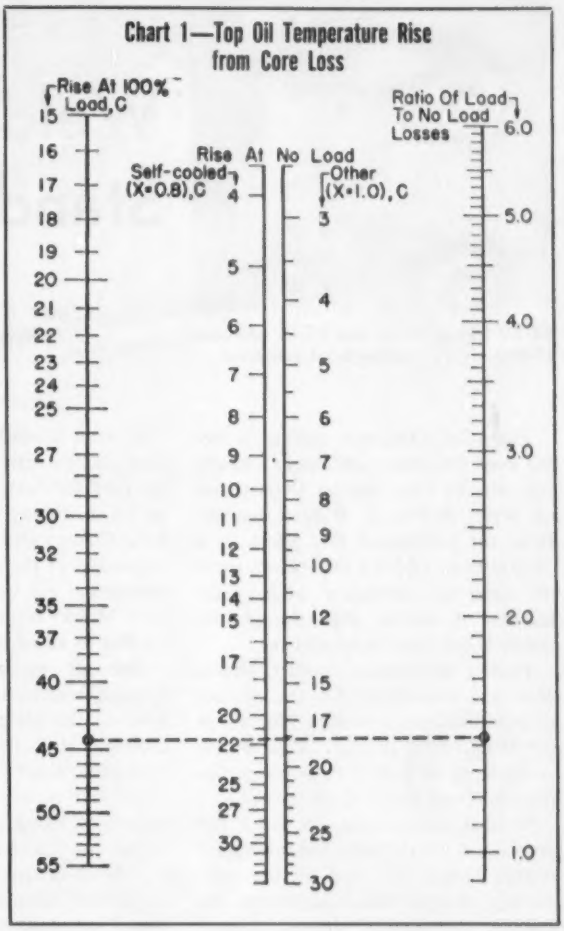
Curves Factor Load Cycles . . . Top-oil temperature rise from copper loss is determined by a new empirical equation which duplicates generally accepted curves with amazing accuracy. Key to this simplification is eliminating ratio of losses as a variable, largely by segregating core loss for separate consideration, and in part by judicious choice of a constant for its residual effect on copper losses. Further simplification comes by expressing top-oil rise from load losses in per unit of the value for continuous operation at full load. Equation for this factor is:

$$F = (P^{1.75} - P_i^{1.75})(1 - \epsilon^{-t/T}) + P_i^{1.75}$$

where P = applied load, per unit of full load.
P_i = prior load, per unit of full load.
t = duration of load P, hours.
T = time constant computed for copper losses alone, hours.

Assuming $P_i = 0$ and plotting values of F for selected values of P against t/T traces the heating curves of Chart 2. Assuming $P_i = 1.80$ and plotting values of F for selected values of P traces the cooling curves. Plotting is on semi-log paper with T = 1 hr. Other time constants are factored by a log-log addition at the bottom of Chart 2.

Third term is the hottest-spot gradient. Based upon knowledge that this gradient rises as the 1.6 power of load, its equation can be written



$$\theta_G = \theta_{G(FL)} \times P^{1.6}$$

where $\theta_{G(FL)}$ = temperature gradient at full load between average copper and average oil.
P = load, per unit of nameplate rating.

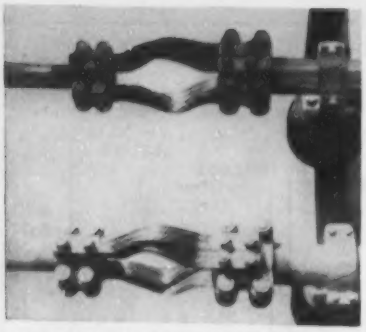
Chart 3 solves this equation by simple alignment.

When test sheets omit average oil temperature, it may usually be assumed to be 10 C below top oil. But hottest-spot gradients less than 13 C indicate desirability of checking top-oil-to-average-oil differential by measurements at the top and bottom connections to the radiators.

Example . . . Determining the hottest-spot temperature of a typical transformer loaded to 160% on a characteristic daily load curve demonstrates use of these charts. Initial top-oil rise should be that at the end of the longest cooling-off period. Assuming approximately 125% of the ultimate rise for light load usually gives good results. But if the final rise after completing the load cycle differs much the cycle should be repeated.

Initial rise factor for this example was assumed at 0.24, approximately equivalent to continuous operation at 45% load. The ensuing 24 hours comprise 4 hours at 100%, 4 hours at 160%, 6 hours at 120%, and 10 hours at 40%.

Computation of hottest-spot temperature is developed on the opposite page. And the final factor of 0.28 confirms assumption of 0.24 to start.



4.8-KV BUS of 1.5-in. and 2.5-in. tube uses Al-clamp, tinned copper-braid connectors

Welded Al Bus Joints Stand Up in Fog

ROY K. MORTEN, Electrical Engineer-Associate, Department of Water & Power, Los Angeles, Calif.

Extruded aluminum tubing is being used for substation bus in a heavy fog area by Los Angeles Department of Water & Power. Welded connections for permanent bus joints in a 30,000-kva, 34.5-4.8-kv station show no signs of corrosion after eight months of service, even though the ocean is but four miles distant.

During the Korean conflict, aluminum was considered for the department's distributing station No. 58 in the Westchester district. This station is outdoors with steel rack bus structures enclosed by 21-ft tilt-up walls.

Welded connections are used for permanent joints, while hot-tin-dipped copper fittings are used for bus supporting clamps and connections requiring disassembly during normal equipment changes and additions.

Extruded 63ST6 aluminum bus was selected because it combines desirable mechanical properties with 50-55% conductivity IACS. For the tapered 4.8-kv main bus, 2.5-in. and 1.5-in. IPS tubing is used; while 1-in. IPS tubing is used for the 34.5-kv buses, the 4.8-kv transfer bus, and transfer bus-tie positions. All feeder buses are ½-in. IPS tubing.

Flexible connectors, made of aluminum clamps with tinned copper braid, are used for the transition from 2.5-in. to 1.5-in. tubing on the 4.8-kv main bus. Clamps also provide for thermal expansion of the bus. Similar flexible connectors are used at the middle of each 34.5-kv bus and the 4.8-kv transfer bus to allow for expansion.

For all transformer, oil circuit breaker, and feeder regulator connections to the aluminum bus, stranded copper cable is used. Stranded aluminum cable was ruled out by the possibility that moisture would enter the connector along the strands and increase the maintenance. Disconnecting switch connections to the bus are made with aluminum tubing. Before clamp connections to the aluminum bus were made, an oxidation inhibitor with suspended zinc particles was applied, and the bus was wire-brushed. Connector bolts were tightened to 200-in.-lb with a torque wrench.

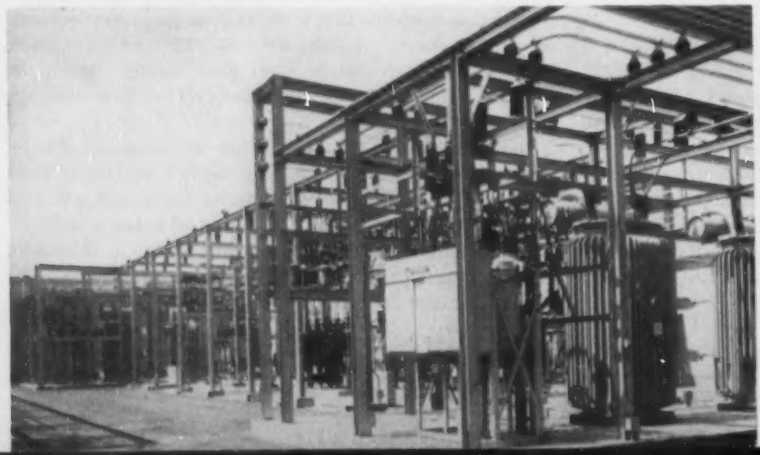
The number of mechanical connections was minimized by using welded joints made by a shielded-arc process. Welding was practical for field use when the bus was joined in place on the rack. All bus runs and taps to the buses are welded. No special cleaning was required on bus prior to welding.

Tube ends were beveled at 30 deg for end-to-end welds before the jig was positioned. Taps were coped to the shape of the main bus run and beveled at 30 deg for tap or tee welds. To attain as complete penetration as possible, double-pass welds were made. This technique left an exposed bead and eliminated the need for back-up at the joints.

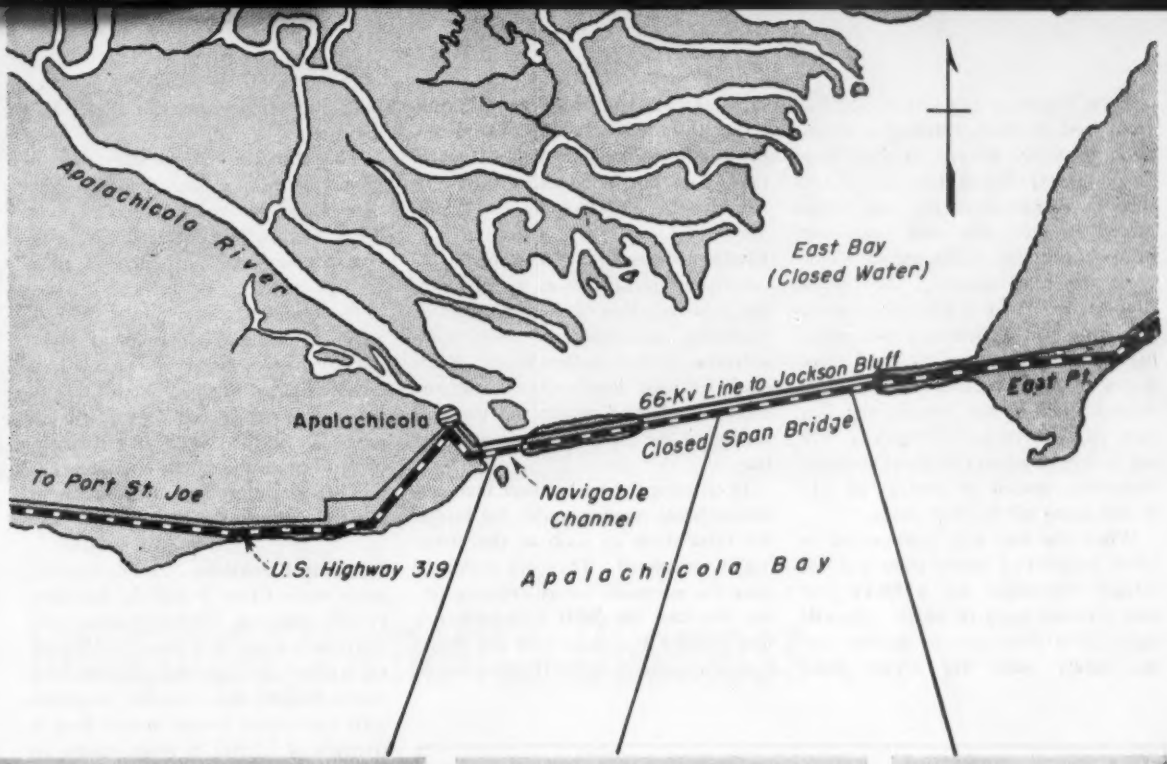
During windy periods, a plywood and canvas housing was placed around the welder and his work to keep the shielding gas around the weld. Because the torch is connected to the welding machine by a 20-ft hose, the welding machine was mounted on a dolly so that the entire welder could be moved easily around the station. To permit welding on bus up to 20 ft high, the welding machine was set in a pick-up truck or even hoisted and suspended from the bus structure. Under these conditions one man could make 15 to 20 welds a day.

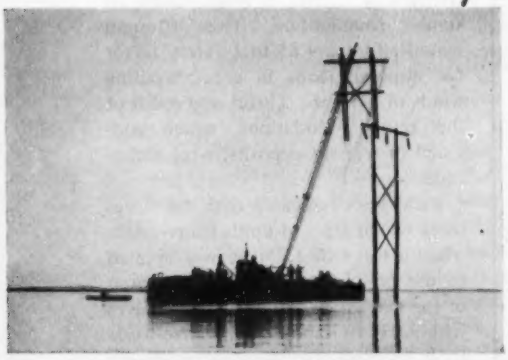
Operating experience at distributing station No. 58 has been satisfactory. Two similar distributing stations are under construction in different areas.

HIGH-VOLTAGE SIDE of 34.5/4.8-kv substation uses 1-in. IPS extruded aluminum tubing for buses. Aluminum clamps with tinned copper braid in the middle of each bus allow for expansion

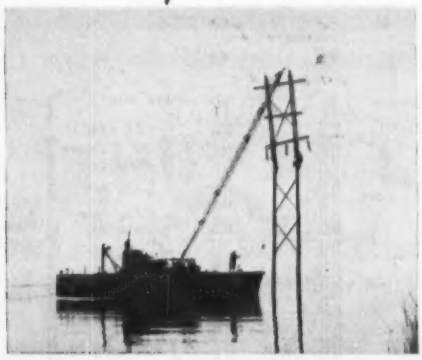


FEEDER CONNECTION of ½-in. tubing welded to 1.5-in., bus has low resistance

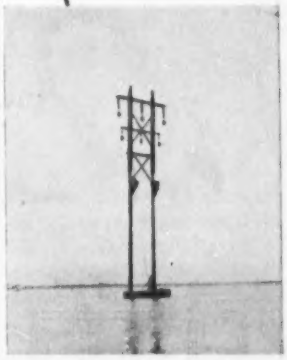




POLE TOP EXTENSION is raised from barge by crane and mounted on existing H-Frame



ADDITIONS to H-Frame to provide greater clearance is fitted and bolted by lineman



LINEMEN complete installation of lines on pole top extension

Pole Extensions End Navigation Peril

I. L. GARCIA, General Engineer, Florida Power Corp, St. Petersburg, Fla.

Pole top extensions on installed two-pole H-frame line structures provided the necessary elevation for Florida Power Corp's 66-kv line crossing Apalachicola Bay when prevailing clearances proved insufficient for fishing boats with 34-ft radio antennas. The installation of such pole top extensions on the existing structures, together with the reinforcement of guys and piles, cost approximately $95,000.

In planning increased clearances, Florida Power gave some thought to replacing the existing H-frames with either steel towers or new and higher wood pole structures. The pole top extensions, however, met the utility's requirements at lower cost.

The steel tower lines, for instance, would have involved erecting 20 towers in silt deposits covered with water to an average depth of 5 ft. Severe foundation conditions would have necessitated footings at an average depth of 45 ft below the ground line. Estimated cost was $692,000. A new and higher wood pole H-frame line would have comprised 39 structures, the poles ranging from 90 to 110 ft in height. Installing these poles would have involved extensive jetting operations to set them at depths between 24 and 30 ft below the ground line. Estimated cost was $252,000.

The average life of the steel towers was estimated at 50 years and that of the new wood poles at 20 years. Existing wood poles have 12 years to go. The yearly reserves for amortizing the investment at 6% carrying charge, plus taxes, maintenance, etc., would result in expenditures of $36,676 for steel towers, $22,554 for new pole line, and $13,139 for extensions.

Line and Clearances . . . The 66-kv line from East Point to Apalachicola, crosses 5 miles of Apalachicola Bay and the Apalachicola River.

U. S. Highway 319 crosses the bay from east to west, forming a closed body of water known as East Bay. The highway bridge consists of two sections of causeway fill, one 3-mile closed bridge, and one open-span bridge over the Apalachicola River.

At the river crossing, the line is supported on two 154-ft steel towers, providing 100 ft clearance over mean high water as required by the United States Army Engineers' stipulation. Across shallow bay waters, the line runs parallel to U. S. Highway 319 and is supported on two-pole, H-frame structures, spaced an average of 623 ft and using 60 to 75-ft poles.

When the line was constructed in 1944, established safety rules did not furnish clearances for a 66-kv line over a closed body of water. Accordingly, 25-ft clearances as defined under safety rules for 66-kv lines crossing over land were applied. Subsequently, a No. 4A Copperweld-copper conductor was attached 9 ft below the 66-kv line conductors as a distribution circuit supplying East Point.

Fishing Fleets . . . The need for additional clearance was the result of the modernization of the fishing fleets, including installation of 34-ft radio antennas on the mother boats. Boats equipped with these antennas take the short-cut channel under the elevated section of the bridge leading into East Bay.

In crossing the boats lower their antennas while passing under the bridge but raise them as soon as the crossing is completed. They are prone to raise the antennas before crossing under the line, the 34-ft high antennas thus coming in contact with the distribution conductor at 16 ft elevation or with the 66-kv conductors at 25 ft elevation.

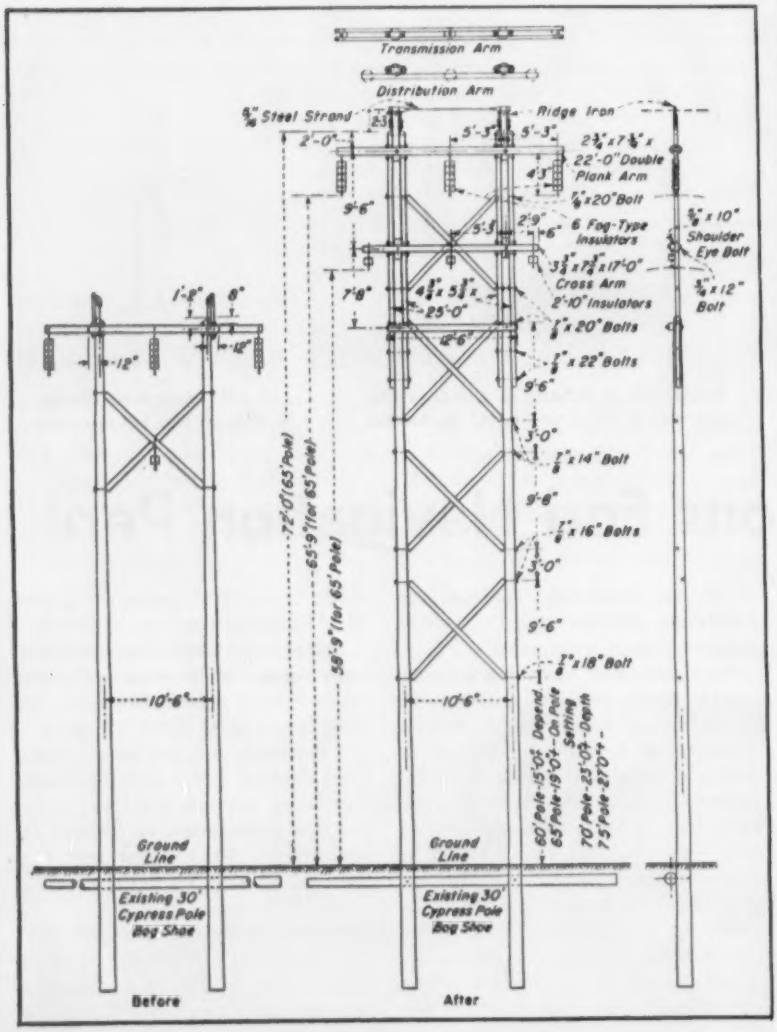
The allowable height of radio antennas on fishing boats had not been determined by any established rule. Thus Florida Power faced the problem of raising the mid-span clearances at high water to permit safe passage of boats already equipped with 34-ft radio antennas. The problem could not be solved, however, unless boat owners limited their antennas to 34-ft. When each side had agreed to its part, the utility could install structures to place the 66-kv conductors at a 43-ft elevation and distribution at 37-ft elevation over high water.

Installing Extensions . . . The existing poles were Class 1 and 2, Southern yellow pine, of 20-lb retention and creosote treated. On these, 25-ft pole top extensions were installed. According to designs, the extended structures with four cross braces would have a strength of 12,000 lb when placed on stable foundations. This strength would afford a 4.85 to 1 safety factor for imposed loads in area-prevailing winds of 67 mph. Thrust and uplift of the actual foundations, which consisted of wet silt deposits, were rather excessive.

Field tests indicated that the structures would start to uplift transversely when a force of 1,750 lb was applied to the 66-kv arm 2 ft from the top of the extension. This value compares with 3,037 lb imposed transverse loads from an estimated 80-mph maximum wind. Higher strength would provide 2 to 1 safety factor to keep the line in place in higher winds likely to develop during summer hurricanes.

The structures, it was found, had very limited in-line holding power. The required strength was supplied by guys on structures within waters not exceeding 2-ft depth. For each structure four anchors were sunk to at least 14-ft depth. To these, eight guys were attached. The guys were of hard-drawn, bare-stranded copper cable which was preferred to Copperweld wires. The copper cable was used to prevent quick deterioration of the conductor by salt water action which occurs when Copperweld strand is knicked during installation.

Structures in the deeper waters of the bay, where depths average 8 ft, will be strengthened by piles consisting of 40-ft poles sunk to 16 ft below the ground line and extending 16 ft above water line for attachment to the poles.



Lighting Specialists Show How . . .

Relighting Benefits Business . . .

Case histories of prize-winning commercial and industrial installations reveal methods applied. Jobs set pattern for a market which has tremendous potential

Commercial and industrial relighting offers perhaps the greatest opportunities for lighting sales over the next decade. The relighting of stores, schools, churches, banks, office buildings, etc, offers a tremendous potential. A survey of an average American city by the Industrial and Commercial Lighting Equipment Section of NEMA disclosed that more than 85% of industrial and commercial buildings were lighted to less than minimum IES Standards.

The advances made in industrial lighting during and since the war have proved that high level lighting can help increase production and better quality. Continued new construction and increased modernization, new and better light sources, fixtures and methods favor a continued upward trend in lighting. NEMA forecasts show a 66% increase in the energy sales for commercial lighting and a 60% increase in the sale of industrial lighting in the next 10 years.

According to E. C. Huerkamp of Westinghouse, chairman of the Executive Committee of the National Lighting Bureau, this replacement market is being neglected because of inadequate preparation by lighting salesmen to exploit it. Also, he claims that there has been insufficient public education of the need for better designed lighting installations. The Industrial and Commercial Relighting Program has been formulated to capitalize on this opportunity and to supply the information, guidance, and inspiration to local groups promoting sales in each community.

The challenge to utilities to build mutually compensating loads for load factor and earnings improvement is being accentuated by the fast growth of air conditioning. Many utilities which do not promote electric house heating, water heating, ranges, etc, are going to find that lighting is the only answer to balancing these summer peaks. Realizing this, the EEI Commercial Lighting Committee has conducted a survey to determine the proper kind of new promotional material necessary to do this job and it plans to have it ready for the fall of 1955.

It is only natural, in view of the above, that the theme of Electrical World's special lighting feature this year should be commercial and industrial relighting.

Prize Winners All . . .

Each of the following articles represents the top job of the year for its author and was a prize winning entry in "My Most Interesting Lighting Job" contest in a section or chapter of the Illuminating Engineering Society. Unfortunately, space was not available to include all the articles. However, the entries of the following authors will be reported in subsequent issues: E. C. Bataille and H. L. Spliethoff, C. L. Daly, A. Ferry, G. Fitzmaurice, R. A. Landry, F. Leffler, John MacFarlane, F. H. Owen, D. M. Reynolds, Harry L. Rhodes, D. E. Seely and K. W. Moore, and R. Williams.

My Most Interesting Lighting Job . . .

L. J. Peterson, Industrial Electrical Engineer, picks high-level, low-brightness lighting as . . .

PERFECT FOR PRECISION MANUFACTURING

High-level low-brightness relighting of the 40,000-sq ft Hillside, N. J. plant of Western Electric Co. makes possible the manufacture and precision assembly of small and even minute parts for submarine cable repeaters.

The use of recessed troffers with cool white fluorescent lamps and low-brightness plastic lenses in a suspended ceiling provides a smooth ceiling for easy cleaning, reduced air leakage and improved color discrimination.

In the production of this precision equipment ideal manufacturing conditions must prevail. All surfaces must be of a type that can be washed frequently without being damaged by water. Suspended lighting fixtures would have been the easiest to install but would have been dust catchers and added to the problem of cleaning and washing the ceiling periodically, therefore, recessed troffers were selected as best fitting the requirements. The lighting troffers were run parallel to the main air ducts, however, branch air duct lines had to cross lighting rows, and here the rows were interrupted.

The 96-in. slimline cool white deluxe lamp was chosen since it is best suited to bring out the minute color discrimination required. It is also best for employee morale.

In order to control brightness in the rooms it was necessary to give equal consideration to all surface finishes. The ceiling was painted white, walls sea foam green and the floor was covered with light grey vinyl tile.

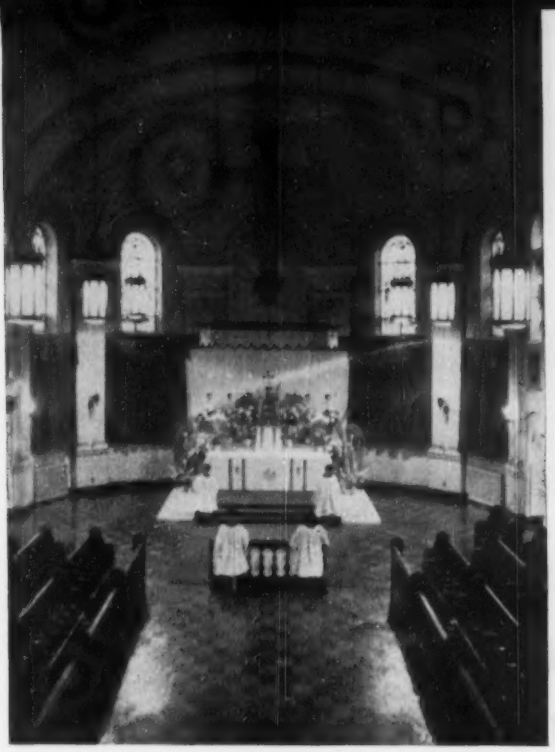
The lighting level in the high bay area is 60 ft-c while that on the benches, under the lower ceiling, is 70 ft-c. The high reflectance of the upper walls aids materially in providing almost as much light on the work in the high bay as in the low bay with the same fixture spacing.

In this job the ceiling gets its upward component from the floors, bench tops and walls. In this manner brightness control was accomplished as shown in the table showing ratios obtained here and those recommended as good practice by IES. The ratios obtained here are far better than those recommended (even for offices) and these values were obtained without extra cost. L. J. Peterson, Senior Electrical Engineer, Western Electric Co.

BRIGHTNESS RATIOS BETWEEN	ACTUAL	I.E.S. RECOMMENDED PRACTICE	
		FACTORY	OFFICE
TASKS AND ADJACENT SURFACES	2:1	5:1	3:1
TASKS AND REMOTE SURFACES	1:1	20:1	10:1
LUMINAIRE AND CEILING	10:1	40:1	20:1
ANYWHERE WITHIN NORMAL FIELD OF VIEW	10:1	80:1	40:1
WALL, CEILING AND FLOOR	1:1	—	—

Relighting Benefits

- Better precision assembly
- Lower brightness
- Lower maintenance costs
- Safer for frequent cleaning
- Reduced air leakage
- Improved color discrimination



My Most Interesting Lighting Job . . .

Harold J. Gruber, Cincinnati Utility Lighting Engineer, selected this Catholic Chapel because it influences other churches as well as . . .

SAVES SEMINARIAN'S SIGHT

Relighting the chapel in Mount Saint Mary's Seminary, Norwood, Ohio, to high level illumination with low brightness, glarefree downlights and indirect wall urns, permits comfortable reading for long periods and easy viewing of ornamental ceiling and mural art work. The glare, experienced with the formerly installed ornamental bronze lanterns has been entirely eliminated. This new installation is being used as a guide by parish priests in relighting their parish churches and has already influenced two other churches in the area to convert to a similar system.

Since considerable reading for rather long periods of time is done in this chapel it was necessary to plan for 25-ft-c lighting level. The bronze lanterns could not be modified to produce this level without excessive brightness.

The side candelabra units, which are mounted about 8 ft above the floor, created distraction and extreme glare since they were near eye level. It was not hard to convince the church authorities that these units had to go.

The area above the ceiling was found to be readily accessible for servicing provided downlites were not located too far down on the slope. A 12 deg sloping body downlite was chosen to meet the low brightness and minimum glare requirements. The unit has a shielding angle of approximately 25 deg. The upper section has a specular Alzak reflector surface and the lower section has matte black finished baffles. Downlites, at front of chapel have a 12-deg polished Alzak "shovel" reflector added to give uniform lighting to rear wall of sanctuary.

To light the decorative ceiling, wall urns with 150-w reflector flood lamps, were installed at the location of the old candelabra units at each column.

Average intensity is about 3 ft-c with urns only. Average intensity is 22 ft-c with downlites, plus 3 ft-c with urns, making a total of 25 ft-c maintained. Harold J. Gruber, Lighting Division, Cincinnati Gas & Electric Co.

Relighting Benefits

- Easier prolonged reading
- More comfortable ceiling viewing
- Enhanced ceiling murals
- Better view of sanctuary and altar
- More uniform light distribution
- Lower brightness ratios
- Influenced other relighting jobs

My Most Interesting Lighting Job . . .

L. M. Bailey, Manufacturer's Lighting Engineer, shows how Denver Bank eliminated desk lamp glare for . . .

GLARE-FREE COMFORT FOR ALL

Hundreds of desk lamps have been eliminated by custom-designed low-brightness controlled equipment used in relighting the Denver (Colo.) National Bank. A uniform distribution of 50-ft-c illumination in all working areas (25 ft-c in all circulation areas) provides a comfortable glare-free and decorative installation. The lighting equipment was designed to harmonize with the ornamental interior architecture and to control brightness ratios in spite of the relatively dark interior.

The former lighting system produced only 3 to 10 ft-c for bank employees working on intricate seeing tasks, and the use of desk lamps on every machine and desk was an absolute necessity. Because of the very dark interior finishes and improper shielding of point-source luminaires, low reflectance factors and brightness contrasts made it extremely uncomfortable.

In order to harmonize with the decorative interior design, it was necessary to use custom-built fixtures but at the same time conform to the limitations of a modern light source, the slimline lamp. High lighting levels had to be controlled for brightness contrasts, due to the low reflectance backgrounds presented by the dark interior. This was accomplished with the use of low-brightness prismatic lenses and low translucence opal glass side panels. Where fixture position was such that its critical viewing angles from employees and the public were unavoidable, the denser monolite glass side panels were used. In all cases they were used in fixtures with incandescent sources.

The architectural, ornamental, structural, and mechanical conditions placed limitations on fixture locations; so a square fixture, mounted on alternate plaques was used. Recessed fixtures were placed between the beams using 430-milli-amp slimline lamps. The open type teller's cage and deal plates extend from under the mezzanine floor out into the high ceiling area. Incandescent units, with 300-w lamps over prismatic lenses of focusing distribution, are combined with the slimline fixtures around the perimeter of this area.

The ornamental chandeliers were retained in the lobby, for decorative effect only. Lamp wattage was reduced to 25 w to eliminate discomfort when viewed from the mezzanine. The mezzanine is used for bookkeeping and is lighted to an average of 50 to 60 ft-c. The bays and skylights permitted use of rectangular and "L" patterns of 72 and 96-in. slimline units, with incandescent prismatic lens corner boxes to complete the patterns. Because of the architectural limitations over the first floor office space and teller area, this was not possible; so continuous rows of slimline fixtures provided the only practical method. Standard warm white slimline and fluorescent lamps are used throughout. L. M. Bailey, Electrical and Lighting Engineer, Engineering and Design Dept, Albert Sechrist Mfg. Co., Denver, Colo.

Relighting Benefits

- Eliminated desk lamps
- More uniform light distribution
- Better harmony with interior
- Minimizes shadows and glare
- Better employee morale
- More comfortable seeing
- Easier maintenance

My Most Interesting Lighting Job. . . .

R. L. Smart, Boston Utility Lighting Engineer, prefers this Utility Dispatching Center because . . .

DISPATCHERS NOW SEE MUCH BETTER

Reflections were eliminated and rapid, comfortable, and accurate discrimination of the system diagram was insured by the combination of a new comfortable lighting system and good visual surroundings in the System Dispatching Center of Boston Edison Co. The dispatchers see much better and without eyestrain, and there is no question but that the new system is a morale builder.

Of course, the finish on the dispatching board, walls, floors, and ceilings (all a part of the over-all relighting recommendations), and the visual environment (of which the lighting is a part) are the real reason for the visual comfort and the enthusiasm shown for this system.

Construction problems made practical the choice of substantially an industrial type of installation. Contrasts were kept at a minimum by use of a high percentage of upward light. Uniformity of illumination was of a high order from such a fixture. The fluorescent fixtures used in these areas are of a general diffuse type with approximately 40% upward and 60% downward distribution. Combined with these in a suitable pattern are silver bowl diffusers with a 3% upward component. Diagram board illumination is obtained by a vertical surface lighting unit with lens control located as close to the board as possible to eliminate reflections. Louvered adjustable housings, advantageously located and equipped with PAR flood lamps are on the emergency circuit.

Illumination levels obtained from the above equipment are "in service" readings after 8 months of operation. Fluorescent fixtures alone deliver 35 ft-c and the incandescent fixtures an average of 25 ft-c for a total of 60 ft-c. The locations and spacings of the fluorescent fixtures are such that during the loss of either ac or dc a reasonable lighting system for emergency use will remain in operation. The diagram board has an average of 40 ft-c in service on the vertical surface from the lens plate lighting alone. General room lighting from the fluorescent and incandescent sources contribute 30 ft-c of vertical illumination for a total of 70 ft-c average over the diagram. The emergency flood lamp units will provide approximately 5 ft-c at the critical areas used during an extreme condition resulting in loss of both ac and dc.

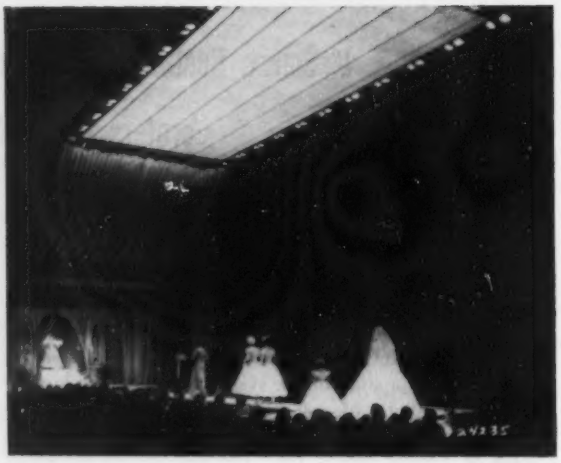
Brightness control and hence worker comfort were achieved by the use of light color high reflectance paint on the walls. Floor tile is of mottled grey. Diagram board is painted with "chalkboard green." Desks and tables were recovered with light grey linoleum.

To assure at least a workable lighting system under emergency conditions, 60% of the horizontal footcandle level was connected on ac and 40% on dc. R. L. Smart, Lighting Engineer, Boston Edison Co.

Relighting Benefits

- Better seeing without eyestrain
- Fewer reflections
- Faster discrimination of diagrams
- More accuracy
- More comfortable work area
- No shadows cast by buttons
- No glare

My Most Interesting Lighting Job . . .



R. T. Dorsey and D. A. Pritchard, Nela Park Engineers, spotlight a Department Store Auditorium which has . . .

MORE GRATIFYING PUBLIC RESPONSE

More effective presentations and a more gratifying public response than ever before are only a few of the results of relighting the auditorium of the Higbee Co, Cleveland department store. The careful integration of the lighting with the design of the room and its high degree of flexibility as to mood, changing colors, and focusing attention are significant. The lighting requirements in terms of many different functions for which the auditorium is used are numerous. In addition to fashion shows and luncheons, the room is used for many civic events, ranging from bridge parties to model airplane shows. The problem was to provide the proper atmosphere for each occasion and to focus attention in certain parts of the area.

General illumination in the space is provided by a luminous panel of corrugated plastic 20 by 60 ft. It was assembled near the floor and then hoisted into place. It is lighted with 40-w rapid start fluorescent lamps in three colors—pink, gold, and blue. These lamps are spaced to give essentially uniform brightness of the plastic in each color and are controlled by the new fluorescent dimmer, which provides control of light output over a range of 100 to 1. This is the first large installation of its kind.

Around the perimeter of the ceiling panel are located PAR-56 spotlamps to focus attention on the stage and on the runway which is used for fashion shows. The beam spread of these lamps covers just a little bit more than the width of the runway. Horizontal illumination is about 200 ft-c and vertical illumination about 80. The lamps are directed so that the illumination is practically constant the length of the runway. The lamps at the stage end of the panel are directed to cover the stage apron; so that as the model steps onto the runway, there are no dark spots.

In between the PAR-56 spotlamps are reflector color lamps in pink, yellow, and blue. These are also aimed at the runway, but their wider spread reaches well out into the audience. The thinking here is that the colored light from these lamps helps to set the atmosphere for various sequences and helps make the audience feel that it is a part of the presentation rather than detached from it. The level of illumination with the yellow lamps on is about 30 ft-c horizontal. Each of the color circuits is on a dimmer as are the PAR-56 spotlamps.

Part of the charm of this area lies in the light grey-green color that was chosen for the walls and for the fiberglas drape which forms the ceiling. It only appears grey-green when the lighting is adjusted so that illumination is essentially white. At other times it changes to fit the mood of the moment. The lower cove near the stage contains incandescent lamps, and the upper one above the loges uses 40-w rapid start lamps, in deluxe warm white, which provide a good match for the incandescent. R. T. Dorsey and D. A. Pritchard, Lighting Engineers, General Electric Co Nela Park.

Relighting Benefits

- More effective presentations
- More enthusiastic public response
- More flexibility—quickly converted
- More distinctive atmosphere
- Higher levels—controlled effects
- Endless variety of moods
- Greater institutional value

My Most Interesting Lighting Job . . .

Fred Astor, Electrical Contractor, points to better lighting as the right prescription for Miami Beach . . .

DRUG STORE SALES AND PROFITS TO SOAR

Relighting the Kasdin Drug Company's store at Miami Beach, Florida with an 80 ft-c luminous ceiling installation has greatly enhanced its appearance and increased its business, according to Julius Kasdin, president.

Anticipating the expenditure of considerable funds for new store fixtures, plastering, painting, and flooring, the customer requested an effective lighting installation. Cost was important, but secondary.

The problem was threefold:

1. Being narrow and in the middle of the block, the store had to attract the eye of people without the use of an overhanging sign, not permitted in Miami Beach.
2. The ceiling was extremely high for such a small area.
3. Depending upon tourist trade almost entirely, the store had to have outstanding attraction.

The luminous ceiling is suspended at an angle with the greater height at the front of the store. This was done because of the unobtrusiveness of the storefront, so as to attract the people on both sides of the street.

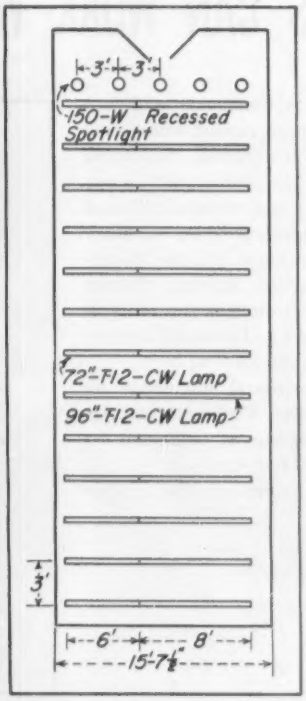
The drawing shows the installation details of the 13 96-in. and the 13 72-in. T-12 cool white slimline lamps above the plastic and sound-absorbing luminous ceiling.

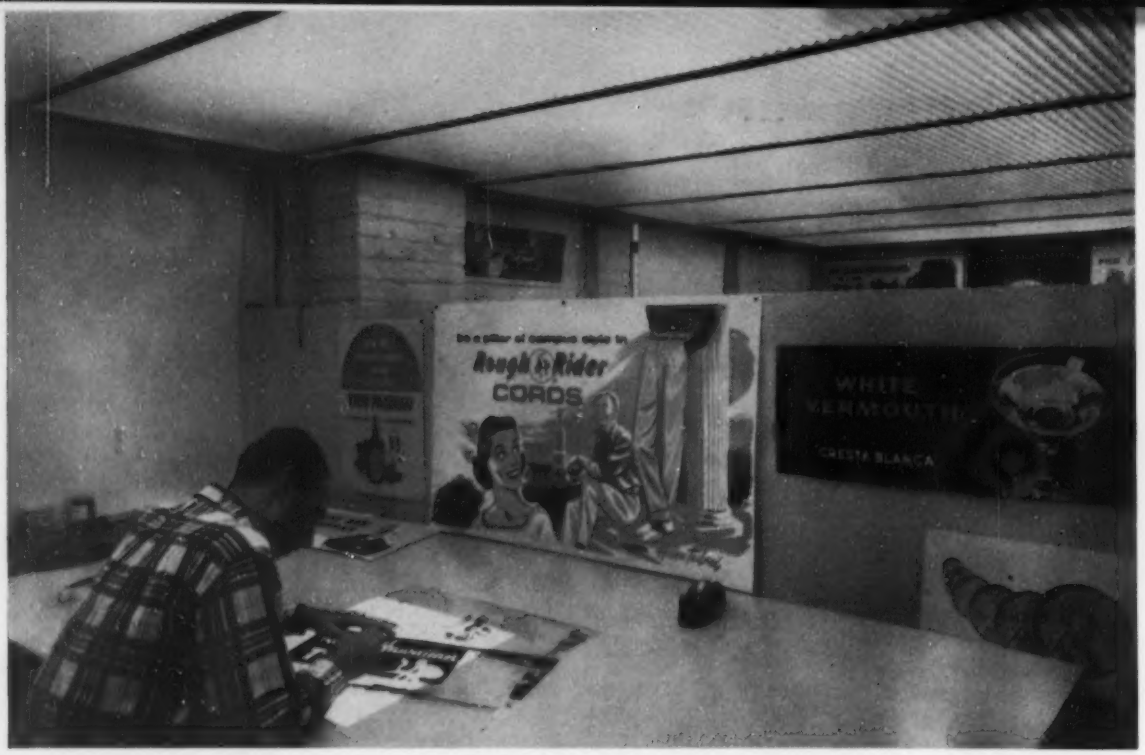
With the use of 5 150-w recessed spotlights in the extreme front of the ceiling naturally pitched at the same angle of the ceiling, the sidewalk is brilliantly lighted. The slant of the ceiling creates the illusion of spaciousness and depth, and the acoustic baffles running across the room give an illusion of width.

Fifty footcandles are maintained throughout with supplementary lighting in show cases adding merchandising punch. Reflectance above plastic is 85%, walls 54%, and floors an average of 35%. Sound absorption by the acoustic baffles is excellent. Fred G. Astor, Astor Electric Service, Inc, Miami Beach, Florida.

Relighting Benefits

- Attracts more customers
- Increases business
- Enhances appearance
- Favorable customer reaction





My Most Interesting Lighting Job . . .

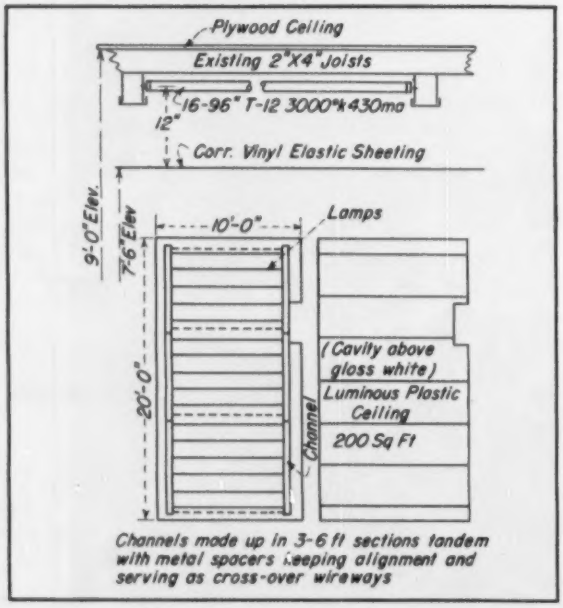
Charles Macy, Utility Lighting Supervisor claims an Industrial Art Department because . . .

ARTISTS CAN WORK WITHOUT FATIGUE

Artists do a better job, make fewer mistakes and turn out more work under a new luminous ceiling installation at the Velvetone Co, San Francisco, California. According to Verne Brant, company official, "the illumination in our Art Department is now shadowless and without reflected glare of any sort. This is vitally important to the accuracy of our stencil cutting, color separations and the consequent register in the end product. Also, the total absence of outside light interference greatly simplifies the recognition and matching of colors. We have had no extra costs or maintenance. Employee morale is at an all time high".

After one year's operation, horizontal intensities on work tables ran from 85 to 119 ft-c. Vertical intensities were 55 to 80 ft-c. Average brightness of ceiling at 90 deg to plastic surface was 190 to 210 foot-lamberts.

Charles W. Macy, Lighting Sales Supervisor, Pacific Gas & Electric Co, San Francisco.



Channels made up in 3-6 ft sections tandem with metal spacers keeping alignment and serving as cross-over wireways

Relighting Benefits

- Increased production
- Better light environment
- More operation efficiency

My Most Interesting Lighting Job . . .

Before and after pictures show why James Miller, Utility Lighting Engineer, picked an Art Gallery where . . .

EVENING ACTIVITY IS INCREASED

Pictures and exhibits are shown at their maximum advantage by the artistic new relighting system installed at the Hackley Art Gallery, Muskegon, Mich., according to the gallery directors:

"The improved lighting has provided a much wider range of hanging exhibits. Evening activities have increased. Previously, special events in connection with exhibitions were avoided as much as possible. The placement of the lighting units is such that the source of light is only necessarily prominent, while in many galleries, one is quite conscious of the overhead mechanics."

Previously, a glass roof and skylight on the art gallery, provided natural light for exhibits and paintings. In most of the rooms 150-w lamps in prismatic reflectors were mounted above obscure wire glass ceiling panels. Footcandle levels were 8 to 12 with 3 to 7 on the paintings.

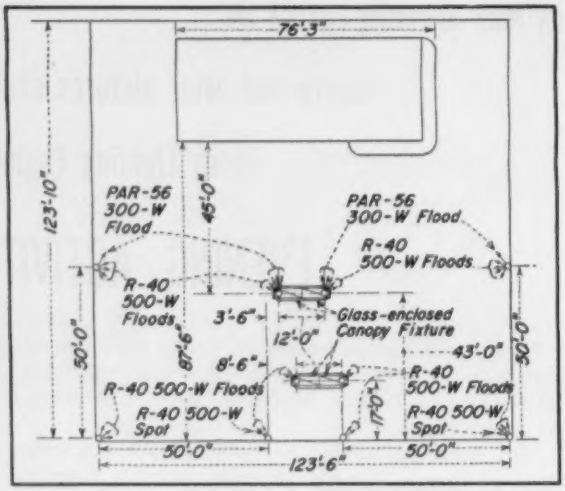
However, as few night exhibits were held, little thought was given to artificial lighting. But when a new sheetrock roof replaced the glass skylight roof and all natural light was cut off, artificial lighting became necessary.

The lighting is arranged in rectangular pattern, parallel to the walls, using recessed louvered fluorescent units and adjustable incandescent units. A total of 45 4-lamp, 40-w and 9 4-lamp, 20-w units were installed to provide 35-45 ft-c of general illumination. To focus additional even lighting to paintings on the vertical surfaces, 90 150-w, PAR 38 floodlights were installed in semi-recessed adjustable units. Vertical illumination is 50-60 ft-c. Deluxe cool white fluorescent lamps were used to combine with the warm filament lamps. Brightness readings are very comfortable.

Total area is approximately 5,000 sq ft with lighting load of 24 kw or 4.8w per sq ft. James Q. Miller, Lighting Engineer, Consumers Power Co, Muskegon, Mich.

Relighting Benefits

- Increases evening activities
- Shows pictures to best advantage
- Widens exhibit hanging range
- Improves color balance
- Harmonizes with ceiling
- Reduces maintenance
- Minimizes vision interference



My Most Interesting Lighting Job . . .

William Bush, Utility Lighting Engineer, picks a Cleveland Service Station that . . .

JUMPED ITS GASOLINE SALES BY 30%

Gasoline sales have increased 30%—from 30,000 to 39,000 gal per month—over the same period last year, mainly because of a modern lighting installation at Collier & Rodgers Service Station, Cleveland. According to Joe Rodgers, one of the owners, "As soon as night falls and the lights are turned on, it just seems as if business gets an additional 'shot in the arm.' During the quiet hours of the evening, while the other four stations in the immediate area have little or no business, our station still seems to attract considerable trade. We can't help but attribute this mainly to our modern lighting installation. Many customers have commented favorably on our spectacular lighting, and, as one said 'It's impossible to pass by without looking.' One of our neighbors commented that it has added new zip to the old neighborhood."

The general lighting of the station utilizes 500-w, R-40 reflector flood lamps, enclosed in standard weatherproof cast aluminum housings, focused at a 45-deg angle. They are mounted on 22-ft poles along the perimeter and center of the area and form a path of light from the aprons to the respective island areas. Most modern stations are equipped with ladders for servicing lights at this height; so maintenance of this equipment is not a difficult problem.

Each island has two glass-enclosed, 8-ft long, standard canopy fixtures with T-12, cool white fluorescent lamps. The angular glass enclosures of these island lights have a side component of light which aids in attracting approaching motorists. Maintenance is a minor factor with these enclosed fixtures. Average illumination in island area is 35 ft-c. IES standard practice is 30 ft-c.

The building front is lighted to an average level of 22 ft-c, as compared with 10 ft-c recommended by IES. It serves as an additional sign and draws passing motorists into the island area. Eight PAR-56, 300-w reflector floods are used for this purpose. They are mounted on the 22-ft poles—six on the near island and two on the perimeter poles nearest the building. This solid blanket of light focused on the white building surface makes it stand out far above the adjacent well-lighted drug store and other buildings in the area. It is, beyond question, the most easily and quickly seen building by passing motorists.

This installation pioneered in the utilization of a new method in service station lighting in this area. It was the first to use two new lamp developments—the R-40, 500-w reflector lamp and the PAR-56, 300-w reflector lamp. And more important, the customer requested a spectacular lighting job. William M. Bush, Lighting Engineer, Cleveland Electric Illuminating Co.

High Intensity Lighting . . . Benefits

- Increases business
- Attracts attention
- Aids servicing
- Improves efficiency
- Speeds work
- Reduces maintenance

My Most Interesting Lighting Job . . .

Ralph Bush, Consulting Engineer, selected an Atlanta Golf Club Stairway because steps were taken to . . .

MAKE IT AS SAFE AFTER DARK AS IN DAYTIME

A unique installation of 25-w tubular lamps in continuous reflectors concealed in the bottom channels of the bannisters of an outside stairway at the Druid Hills Golf Club, Atlanta, Ga., has made "these steps as safe to use after dark as in the daytime" according to A. C. Chapeau, general manager of the club.

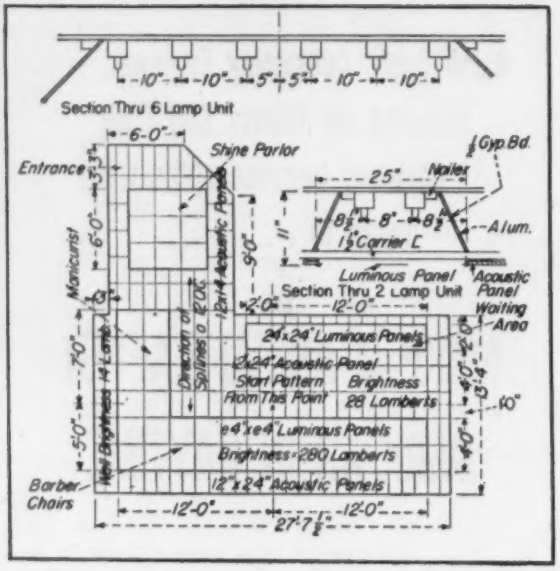
As this was an outside stair, with no roof or canopy, and because of the type of construction and location, it could not be floodlighted from either the yard or building. What appears to be a stone pilaster in the photograph is a large stone pylon extending from the ground to well above the roof and has the club emblem on the outside face. To attach any type of downlights or floodlights on this pylon would have destroyed its beauty. Therefore, some other method of lighting had to be used.

The bannisters consist of three metal channels on each side. After studying this design, it was decided to use the bottom channel just above the steps as a place for the lights. The architects cooperated by making the channel large enough to accommodate a continuous reflector. One 25-w T-10 tubular lamp is over each step with 12 over each landing. The reflectors were continuous in the 2 by 3-in. channel. Reflecting surface was baked white enamel. There is approximately 40 ft-c on the ends of the steps and landing and approximately 25 ft-c in the center of the steps.

The Pro-Shop room is lighted by three 8-ft, two-lamp, recessed troffers with Fota-Lite glass panels. There are also three adjustable spots in the ceiling for accent lighting. Lights in the display and wall cases complete a well lighted room. The lounge on the main floor is lighted by 150-w concentric louvered units installed at random flush in the ceiling. L. Ralph Bush, Registered Electrical Engineer, Atlanta, Ga.

High Intensity Lighting . . . Benefits

- Safe after dark
- No glare
- Increased usage
- Enhances architectural beauty



My Most Interesting Lighting Job . . .

A barber shop, says Sy Hughes,

San Francisco lighting engineer, because . . .

BUSINESS PICKED UP OVER 10%

Integrated multi-purpose relighting of the barber shop in the Mark Hopkins Hotel, San Francisco, Cal., has provided a flexible lighting system, uniform light diffusion and a pleasant atmosphere. Since relighting and remodeling, business has already increased 10% and is expected to continue to climb. An extra barber has been employed and all the barbers now have their chairs filled most of the time. The barbers find it easier to do their work in the more restful atmosphere and they now do their work more efficiently and quicker. Customers leave the shop feeling pleased with the service they now get.

The problems which added interest to the project were:

1. A low ceiling height.
2. Mirrors on one wall—creating glare.
3. Two small windows on outside wall which did not provide enough light for consideration in over-all illumination, but gave two narrow slits of glare.
4. Desire of owner to create the feeling of space and natural outdoor lighting.

General lighting is from a 48-in. wide and 16-ft long luminous panel over the barber chairs 2 ft from the mirrored wall using 4 - 8-ft slimline strips spaced 9 in. on center and 24 - 4-ft T-12 lamps providing 120 ft-c.

A 24-in. wide and 12-ft long luminous panel over the waiting area 2 ft from the photo mural using 2 - 12-ft slimline strips spaced 8 in. on center using 6 - 4-ft T-12 lamps provided comfortable reading light of 50 ft-c.

The shoe shine stand had to have good light to accent work and also light the entrance but not create a glare at the door. A 6-ft x 6-ft luminous panel was used in this area to make it seem larger than it actually was and 6 - 4-ft T-12 lamps provided light of 50 ft-c.

The manicurist required a soft light of medium intensity. In this area a 48-in. wide and 8-ft long luminous panel using 2 - 8-ft slimline strips and 8 - 4-ft T-12 lamps gave a soft shadow-free light of 40 ft-c.

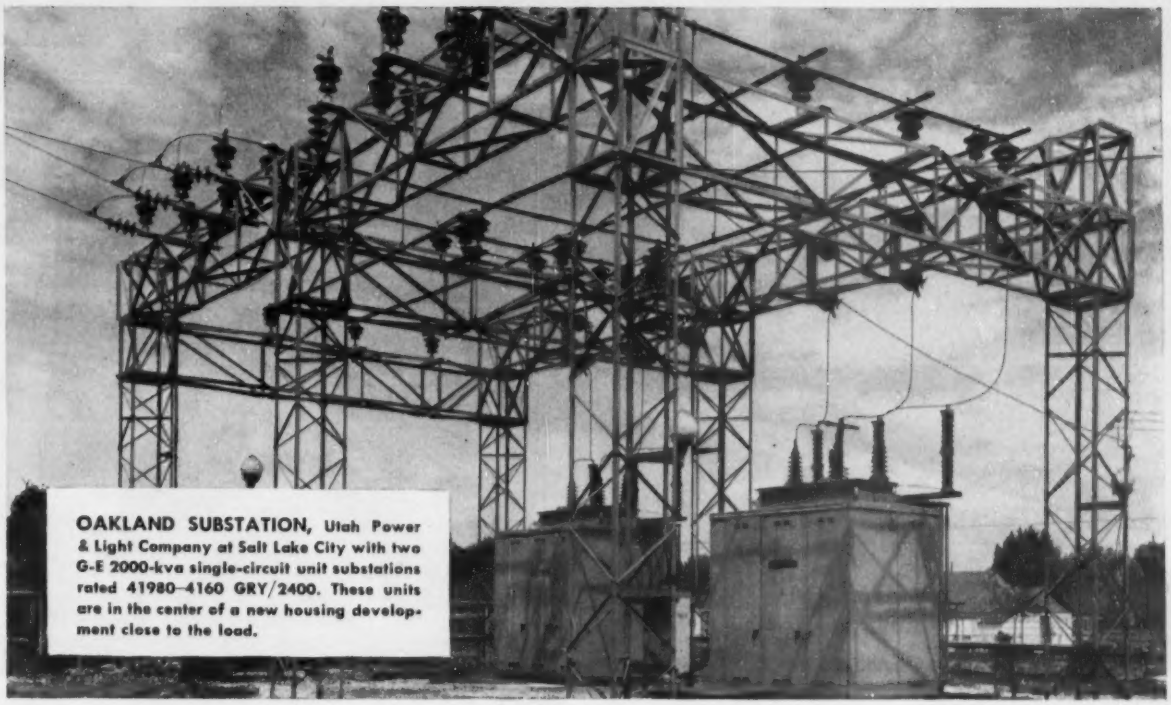
To eliminate hard contrast between luminous panels and dark acoustical tile, the luminous panels were made to drop 1¼ in. below the adjoining ceiling so they would flow light to the side and blend with the acoustical tile.

For good diffusion the luminous panels have a light transmission factor of about 55%. The plastic coffers are 24-in. x 24-in. removable units resting in a metal framework for easy access to lamps. Over-all average of walls and ceilings to light source ratio is less than 10 to 1.

Before installation this room had 15 - 100-w fixtures providing average of 15 ft-c. New installation using 2400 w delivers high of 128 ft-c and low of 45-ft-c, less than double the wattage, but with illumination level raised four and a half times. Sy Hughes, Lighting Engineer, F. K. Pinney, Inc., San Francisco, Cal.

Relighting Benefits

- Increased business
- More efficient work
- More restful atmosphere
- Better employee morale
- Better satisfied customers



OAKLAND SUBSTATION, Utah Power & Light Company at Salt Lake City with two G-E 2000-kva single-circuit unit substations rated 41980–4160 GRY/2400. These units are in the center of a new housing development close to the load.

When load doubles in new housing area . . .

Utah Power & Light Company meets demand with G-E single-circuit unit substations

2000-kva units conserve space, permit shorter lines, reduce installation, maintenance costs

To meet the tremendously increased power demand that has developed in Salt Lake City since World War II, Utah Power & Light Company has now standardized on the use of single-circuit unit substations. Ten years ago there were only three unit subs in the area . . . now there are twenty.

Load-growth problems simplified with G-E single-circuit unit substations because they incorporate transformer, vertical lift magne-blast air circuit breaker, load-ratio-control with voltage regulation, meters and other necessary instruments in a single, fully co-ordinated enclosure. They permit:

- Lower land cost because they require minimum space.
- Shorter lines because they can be located close to load.
- High re-use value because units may be easily shifted if the load changes or is seasonal.

Low and predictable installed cost, because there is nothing else to buy . . . nothing to overlook. Purchasing is simplified . . . only one specification, one purchase transaction. Repeat orders can be placed without further engineering or specification writing.

Standard ratings. G-E integral type unit substations are furnished in ratings from 12 to 66 kv incoming voltage. They have their widest application in areas of light-load-density where a single 2.5- or 4.33-kv feeder with 1000 to 3000 kva of load is to be served, or in the 15-kv class for loads of 1000 to 5000 kva.

If you are faced with load growth problems, investigate G-E single-circuit integral unit substations. For full information get in touch with your nearest G-E Sales Representative, or write General Electric Company, Section 422-7, Schenectady 5, N. Y.

DWANE G. JENSEN, Substation Supervisor, Salt Lake City Division, Utah Power & Light Company, inspects one of the new G-E single-circuit substations.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Residential Load Will Equal Industrial Load

1954

Here's the most economical way

Use G-E Unit Substations to reduce system investment

Add capacity to handle your steadily growing residential market and do it the most economical way with G-E Unit Substations.

No excess investment is needed because you buy no more capacity than is actually required. That means economy today—plus quick and easy expansion to meet the demands of tomorrow.

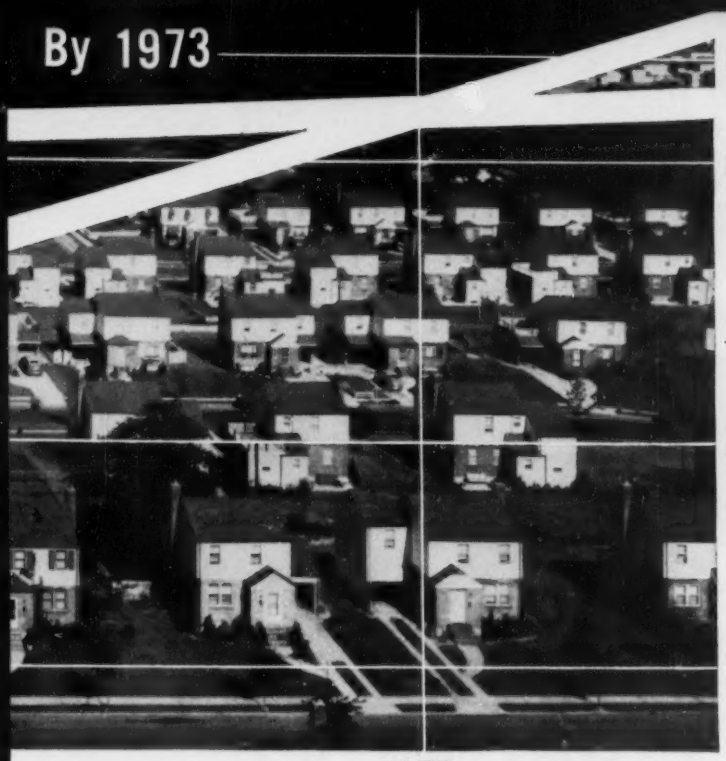
G-E Unit Substations can simplify the problems of expansion as requirements increase. Advance planning and proper substation selection, for example, permit you to expand a radial system into a network system.

Have capacity available when you need it by ordering G-E Unit Substations in advance on the basis of predicted load growth. Then, when your load grows, select sites where capacity is needed and your substations are ready to be installed.

"How to Reduce System Investment" (Bulletin GEA-5847) will help you plan for economical system expansion. It discusses system planning and reveals how other utilities are handling rapidly growing loads. For your copy, write General Electric Company, Section 512-3, Schenectady 5, N. Y.

Progress Is Our Most Important Product

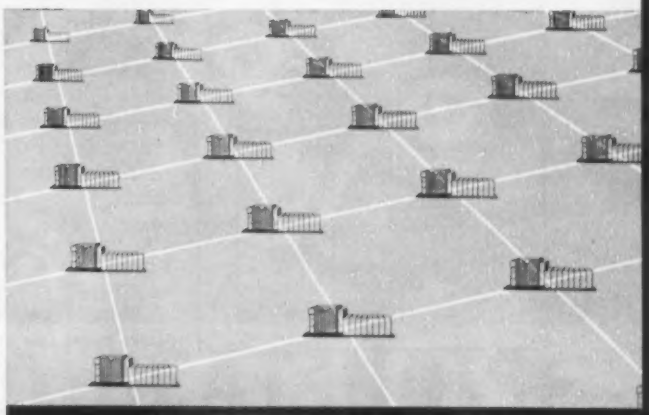
GENERAL ELECTRIC



RESIDENTIAL LOAD IS GROWING rapidly, and is expected to equal industrial load by 1973. Utilities can meet their residential distribution demands yet trim system investment by advance planning with G-E Unit Substations.

to grow with your residential load

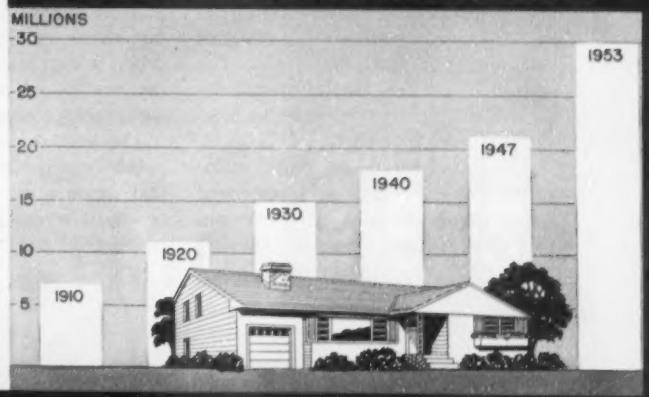
LOCATIONS FOR UNIT SUBSTATIONS are "on the mile every mile" to economically serve residential areas. By properly locating small unit substations for expansion into such a system, utilities can economically grow with increasing demands and provide residential customers with economical power and maximum service continuity.

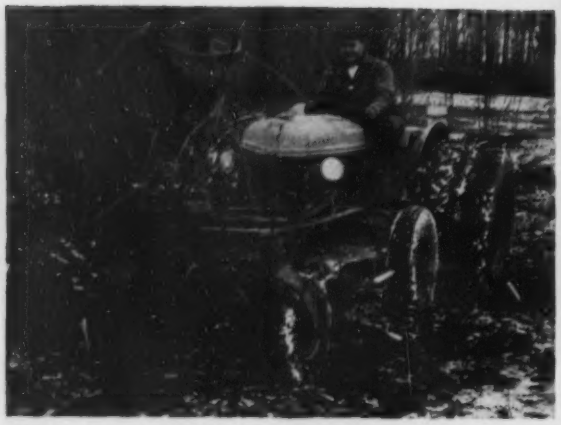


EVERY MILE ON THE MILE

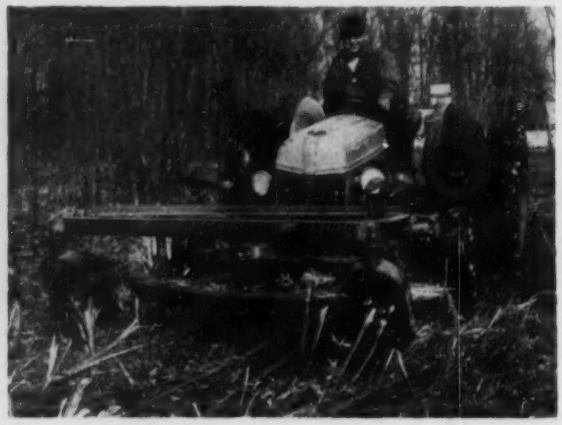
POPULATION GROWTH in the U.S. since 1947 has been 11%—population in the suburbs has grown 43%. Since 1941 the average kilowatt-hours use per residential customer has doubled every 10 years and is expected to double again in the next decade. This fast-growing suburban growth trend has been going on for a long time—is expected to last indefinitely.

HOW THE SUBURBANITES MULTIPLY

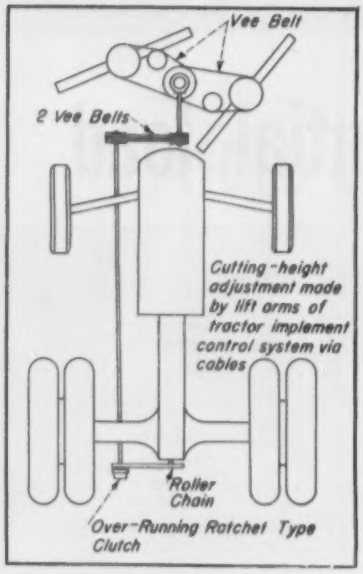




HEAVY BAR on front of the brush-cutter bends trees to the ground, and whirling blades cut off and chew up the wood in their path



WITH HEAVY THICK growth the brush-cutter makes second pass with blades in lowered position. It leaves a swath in its wake


Vee Belt
2 Vee Belts
Cutting-height adjustment made by lift arms of tractor implement control system via cables
Roller Chain
Over-Running Ratchet Type Clutch

CUTTING BLADES are driven through belts, gears, shafts, and clutch from tractor engine. Blade height from ground can be adjusted by the implement control system cables

Forest Mower Clears Right-of-Way

G. M. COX, Assistant Manager of Purchases, Detroit Edison Co, Detroit, Mich.

A brush cutter used by the overhead line crews of Detroit Edison Co clears right-of-way of brush growth up to 3 in. in diam. Growth over that size must be cut by hand. The brush-cutter will clear a tract 100 ft by 400 ft in one to two hours and saves time and reduces right-of-way clearing costs.

Brush cutter is an overgrown type of power lawn mower with two large blades that revolve in a plane parallel to the ground surface. It is used chiefly on second-growth small trees and brush.

In heavy growth the blade is set high for the first swing through the brush and then lower for the second trip. The brush cutter is operated by only one man.

As the cutter approaches the brush the heavy bar on the front bends the trees to the ground, and the whirling blades cut the brush and chew up the wood in their path.

Special Unit Checks Supervisory Equipment

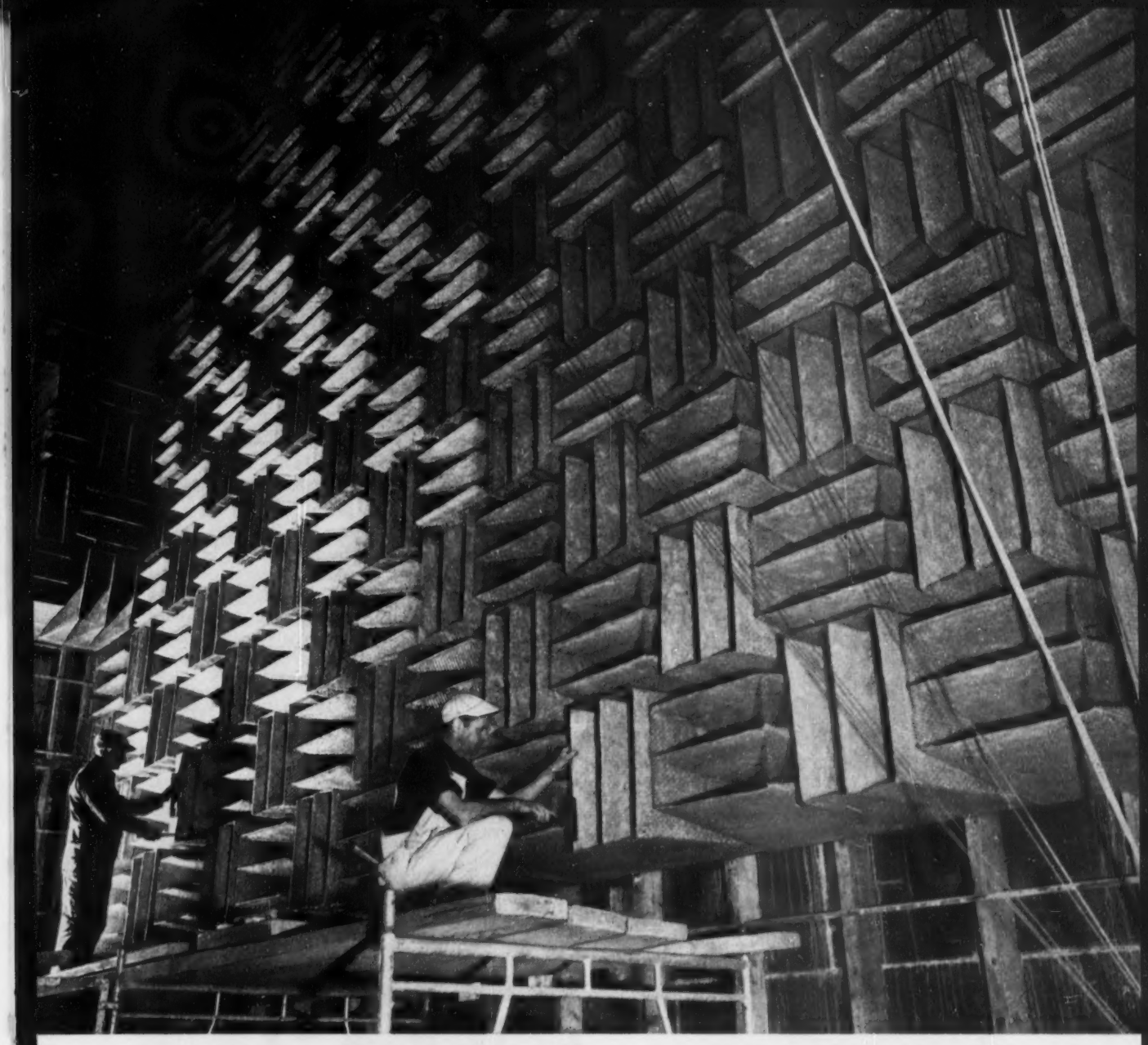
A. B. DAY, Engineer, Idaho Power Co, Boise

Checking of supervisory equipment that is operated over power line carrier is aided by a special test unit designed and built by Idaho Power Co. The unit is for use on General Electric Co supervisory installations prior to making final installations.

The easily-portable tester comprises a control head and associated power supply and relay box. The control head mounts toggle switches by which an eight-impulse code used in the installations may be established. Suitable lamps and reset switches permit either receiving or sending the code. A start button is used to initiate the sending of proper pulses to the supervisory equipment.

The control head connects to the power supply through a long cable that permits the operator to inspect or adjust several pieces of equipment without having to move the more bulky power supply. Taking power at 110 v, the power supply consists of a full-wave rectifier and the necessary relays to send or receive the code. An autotransformer and voltmeter are normally used to adjust voltage for proper operation.

The first problem encountered on new equipment is to ascertain whether points respond properly to the assigned code. To check this, the test set is connected through the power box to



BEING BUILT TO BEAT NOISE

Workmen are putting the finishing touches on a new million-dollar tool to help rid transformers of objectionable noise. The new General Electric Sound Laboratory—56 feet wide, 66 feet long and 49 feet high—will be large enough to test any power transformer anticipated within the next decade.

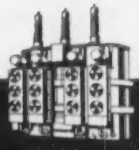
Sound-absorbing pattern shown above is made by 28-inch wedges of fiberglass. The 4½ foot thick walls also consist of concrete, masonry, copper shielding to keep out radio waves and a sound-absorbing-air space.

Located at Pittsfield, Mass., this new anechoic sound chamber will help pinpoint the causes of transformer noise more thoroughly than ever possible before and will aid our research engineers in their quest to lower noise levels without increasing costs to the user. General Electric Company, Schenectady 5, New York.

421-22

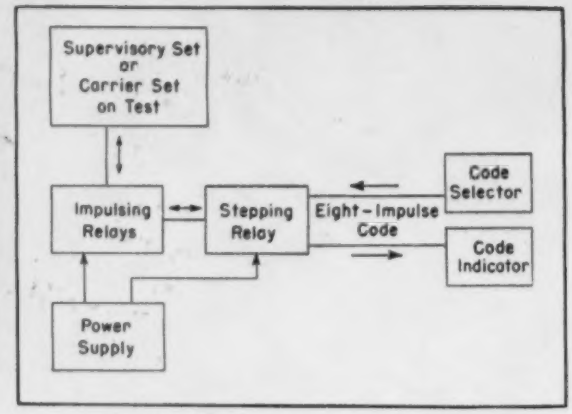
Progress Is Our Most Important Product

GENERAL ELECTRIC



Power Transformer NEWS

CARRIER-SUPERVISORY equipment is checked in the field with this two-unit test set to insure that connections are made properly



EIGHT-IMPULSE CODE from code selector unit is fed into equipment under test. Returning check code is shown by lights on code indicator

the sending and receiving terminals of the supervisory equipment. Points are selected and set up for proper code by the toggle switches and the start button is pushed.

Assuming that operation is correct, the supervisory will accept the code and send back a check code. This check code consists of eight pulses and the point is determined by whichever pulse is missing. Thus, lights will be energized above the toggle switches that have been switched to "on"; lights should be de-energized above those which have been switched to "off".

The test unit may be used in trouble shooting because it may be used at the substation without involving the carrier channel. This procedure has been most helpful in cases where it was difficult to tell whether the carrier channel or the supervisory was causing the trouble.

Plastic Pipe Protects Meter Wiring Satisfactorily

L. T. REITZ, Meter Engineer, Western Div, Ohio Power Co, Lima, Ohio

Flexible polyethylene plastic water pipe has possibilities of becoming a satisfactory tube for secondary leads on either primary or secondary meter installations.

Advantages of using ¾-in. plastic containing No. 12 coded wire include the following:

1. Quite flexible and impervious to oil and corrosive vapors.

2. Has good insulating qualities.

3. Simplifies secondary leads for instrument and bushing transformers in substations.

4. Can completely enclose secondary leads which must be carried from one crossarm to another on primary-pole-meter installation.

5. Eliminates need for nipples and various fittings.

6. Permits using small holes to bring out various secondary leads.

7. Adapts to threaded 1 in. openings because a ¾-in. plastic pipe fits snugly inside 1-in. aluminum watertight cable connectors commonly used.

8. Adapts to most types of instrument transformers.

9. Costs about $9.45 for a 20-ft cable run.

10. Requires no time for cutting and threading as for some other materials thus cutting labor costs.

11. Saves about 5 cents per ft over other methods for secondary meter construction.

Flexibility of this plastic material remains unchanged at temperatures ranging from 70 to 140F, according to

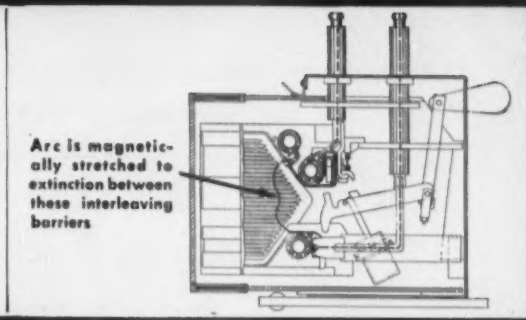
(*Continued on page* 118)

POLYETHYLENE PIPE (see arrows) is used in this substation for secondary meter leads from instrument transformers. At ends of pipe and where pipe connects to aluminum cable, fittings are sealed

4 reasons why G-E magne-blast breakers are best for metal-clad switchgear

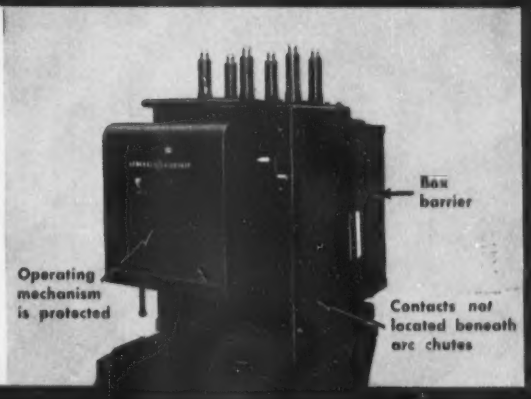
1 Most reliable operation

The G-E magne-blast principle of arc interruption has been proved by years of heavy duty operation in utility reclosing feeder service, high capacity motor starting applications, arc furnace control, and tough capacitor switching jobs. ALL THREE PHASES are switched simultaneously—eliminating any possibility of "single phasing" the load due to switching. Booster cylinders provide quick low current interruption—magne-blast blowout coils assure super-fast high-current interruption.



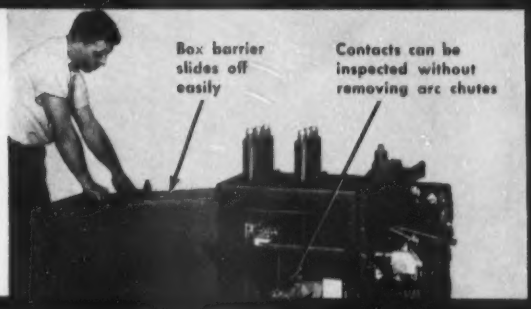
2 Seldom needs maintenance

Most causes for maintenance have been eliminated or reduced in G-E magne-blast breakers. Products of arc interruption cannot fall on the contacts because the arc chute is located *horizontally to the rear* of contacts. Box barrier, which is not open at top, helps protect arc chutes. Operating mechanism is protected by steel cover. Interrupting characteristics of arc chutes actually improve with age. The arc is magnetically stretched to extinction in AIR—eliminating oil maintenance problems. Although normal G-E recommendations are for inspection and maintenance once a year, many users find inspection every two or three years is adequate for their needs.



3 Easy to inspect

All parts of G-E magne-blast breakers are readily accessible for inspection and maintenance. Contacts can be inspected *without removing arc chutes.* Lightweight box barrier *slides off* for easy inspection of arc chutes. Operating mechanism is located outside and in front of breaker—can be reached without removing breaker from housing.



4 Designed for greater safety

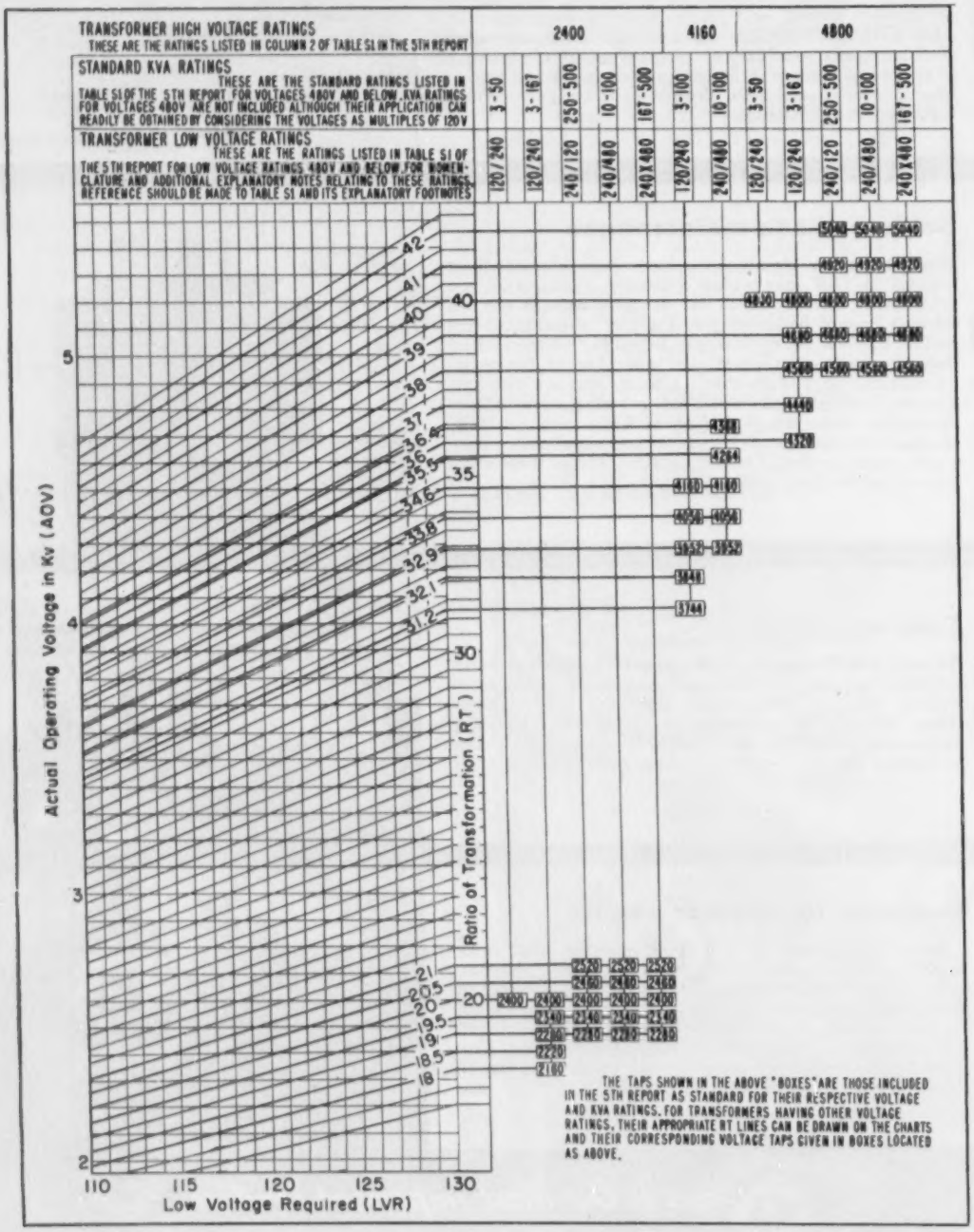
Low center of gravity of G-E breakers makes them practically impossible to tip over accidentally—reducing this common hazard of breaker handling. Compare the low center of gravity (at right) with that of any other breaker on the market. And for greater operating safety—service-proved Self-X insulation, which will not support combustion, provides better *built-in fire protection* for breakers in case of trouble. General Electric Co., Schenectady 5, N. Y. 511-5

Progress Is Our Most Important Product

GENERAL ELECTRIC

Distribution Transformer Selection Chart 2,000 to 6,000-V Range

Chart to determine range of high-voltage taps required, to select transformer and tap to be purchased, to determine tap settings, was produced by an EEI-NEMA Committee



Third in a series of three charts. A description of the charts, an application and the 9-15 kv chart were published in Electrical World, July 12, 1954, pages 122 and 123. The 6-9 kv chart was published in the issue of July 26, 1954, page 116.

How this condenser shell of HERCULOY was welded

Here is one of two large vapor condensers made by Farrar & Trefts, Inc., Buffalo, N. Y., for National Aniline Div., Allied Chemical & Dye Corp. The shells are of Herculoy, Revere's silicon bronze. They were welded by a semi-automatic consumable-electrode gas-shielded method, which has decided advantages in speed and rate of deposition, plus minimum distortion. The latter was important in this case because of the limited clearance between shell and the bundle of 2150 copper tubes.

Welding was done at 300 amperes. Feed, 320 inches per minute, using 1/16" diameter Herculoy wire, AWS.E-CUSI. Welds which might cause troublesome distortion were peened. No preheating was required, and no clamping or jigging. Plates were beveled with a 60° included angle, welded from outside, back-chipped and welded from inside. Frequent spot X-rays were taken, plus close inspection, to make sure operator was into sound metal. The condenser also has solid Herculoy flanges, 4" square. These were built up in three segments, welded flat, then cold rolled to 90" diameter, without cracking the welds. After machining there was no sign of porosity or cracking.

Copper and copper alloys can be quickly and perfectly welded. The Welding Section of the Revere Research & Development Department will be glad to collaborate with you on welding matters.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

LOWERING 25-ton bundle of copper tubes into welded Herculoy shell. A special steel cradle was devised to handle the bundle. Clearance between bundle and shell, 3/8". In all over 75,000 pounds of copper and copper alloys were used in each condenser.

Plastic Pipe

(*Continued from page* 114)

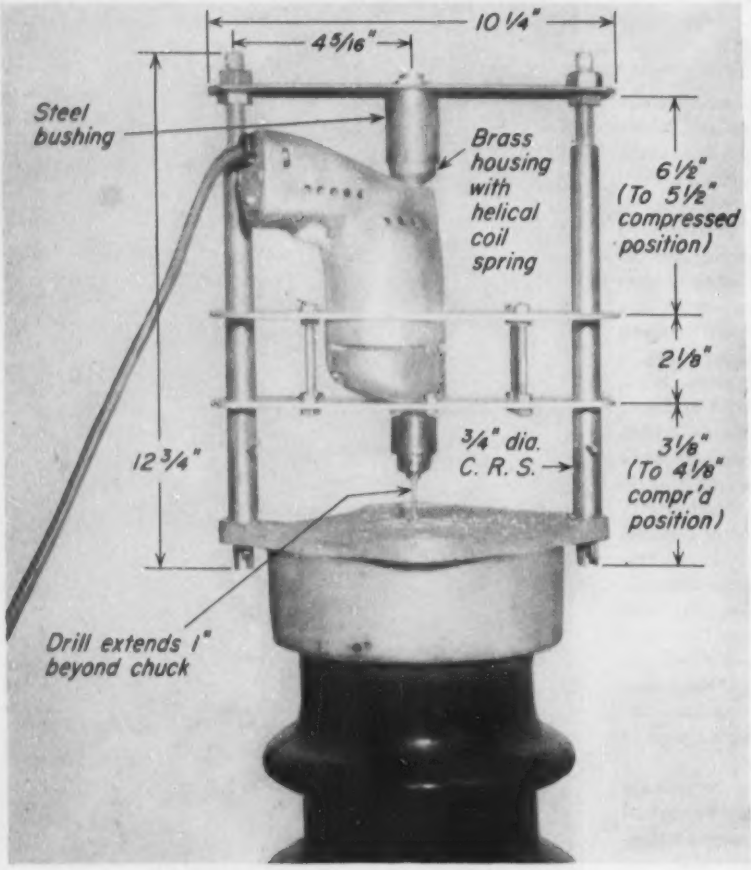
manufacturer. It will begin to soften at temperatures above 140F.

Very little tension on the pipe will exist if it is properly supported with pipe straps.

The plastic pipe's protection against spurs, pike poles, nails, etc, is in the same class as that of cable used for pole metering.

Due to lack of experience, present applications are limited to experimental installations, preferably within substation enclosures where probability of mechanical damage is minimized.

Holder Permits Safe Drilling of Lightning Arresters


10 1/4"
4 5/16"
Steel bushing
Brass housing with helical coil spring
6 1/2" (To 5 1/2" compressed position)
2 1/8"
3/4" dia. C. R. S.
3 1/8" (To 4 1/8" compr'd position)
12 3/4"
Drill extends 1" beyond chuck

W. C. FEASTER,
Electric Engineer, Potomac Edison Co, Hagerstown, Maryland

An electric-drill holder permits safe drilling of sealed lightning arresters to relieve internal pressure resulting from electrical failure. Potomac Edison Co developed the holder to prevent reoccurance of an accident that resulted when the released gas ignited and severely burned the workman as he was drilling an arrester.

The device attaches to the arrester cap and holds and guides a standard ¼-in. electric drill. Pressure is applied by an encased spring applied to the back of the drill. The helical spring (compressed pressure 30 lb, 1-in. extension 20 lb) is enclosed in a brass spring housing that fits into a steel bushing attached to the drill frame top.

Pins in the mounting frame limit travel of the guides and drill to about 1 in. The drill is started by a switch on an extension cord plugged into a convenience outlet at a remote location.

DRILL ATTACHMENT positioned atop sealed lightning arrester permits operator to stand at safe distance during drilling operation

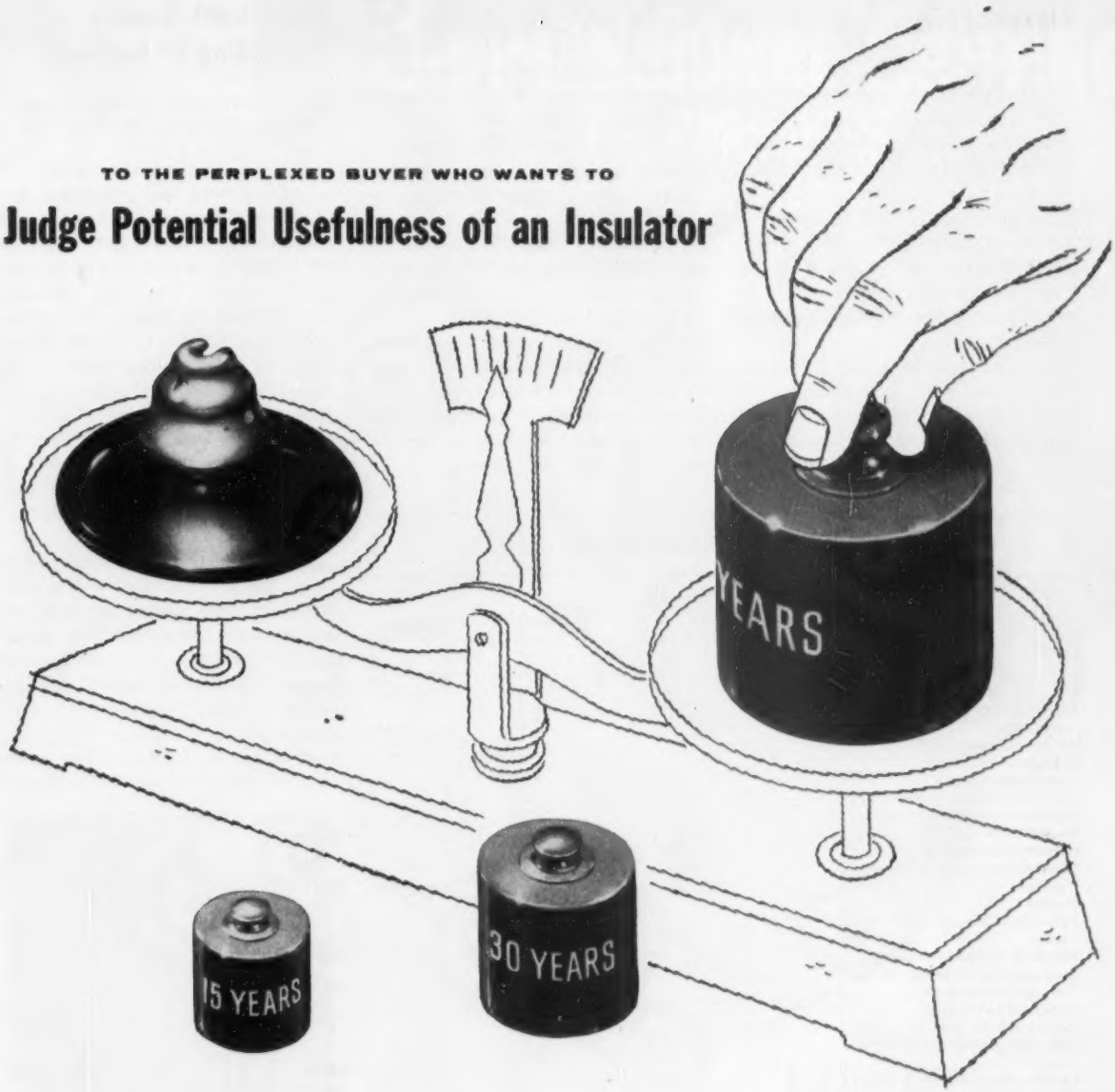
Tension Brake Costs $30

Control of wire being unreeled from a standard reel-trailer is afforded by a simple brake used by Puget Sound Power & Light Co. The braking system consists of a salvaged auto wheel which is attached to the reel with four lag bolts. A brake band passes over the wheel and is fastened to a brake lever on the trailer undercarriage. The lever was made from old line hardware fittings.

A peavey handle placed in the lever lessens the effort needed to control the brake. Total cost of the braking system, including labor, was about $30. The brake will effectively control the stringing of all the conductor on a given reel. In one instance, tension on about 6,000 ft of wire being strung during a rebuild was easily controlled.

TO THE PERPLEXED BUYER WHO WANTS TO

Judge Potential Usefulness of an Insulator



Isn't this the core of any valid comparison between suspension insulators:

The thing that determines your best insulator investment — at competitive prices — is length of service under your service conditions.

Thus, to invest wisely, it would seem that the buyer should have some precise means of determining future performance. Nothing of the like exists, sadly, and no manufacturer can guarantee performance over extended periods of time.

However, there is a method for evaluating potential usefulness of a given lot of insulators.

Manufacturers competing for your business submit quality control data from statistical sampling. From the data for each lot, you can determine if that lot has similar, better, or worse characteristics than previous production from that manufacturer. If control data shows current production corresponds to past, and if past output has given good service, you may infer the insulators you buy now will serve equally well. If data indicates current production corresponds to past, and past output has performed badly in use, you may infer that the insulators under consideration will also give trouble.

This seems to be a good place to point out that O-B Suspension Insulators made in 1919 are still in service. We're confident that younger O-B units will match that record just as soon as time permits!

Ohio Brass

MANSFIELD OHIO, U.S.A.

4440-H

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Inspection Schedule Aids Workmen

Electrical apparatus on the New England Electric System is periodically inspected according to time intervals based on continuing extended studies of field requirements. For convenience of operating personnel in this large group of utilities, the inspection periods normally employed have been charted as shown. Required inspections may occur every 6, 12, 24, or 36 months, depending on the type of apparatus.

For intervals of 6 and 12 months inspections may be complete or limited, as indicated. When 24 or 36 months are allowed to elapse, a complete inspection is required. Provision is also made for leeway between inspections in cases where equipment is subjected to heavy duty or frequent operation. These intervals may be shorter or longer, as determined by both engineering and operating experience.

Instructions have been issued for each type of inspection, and the objective is to present these in as brief form as possible. Records of inspections are filed centrally on 4 x 6-in cards, using both sides. In some cases foremen are provided with manufacturers' instruction sheets or books to cover greater detail in checking up the condition of specified equipment.

Periodical Inspection of Electrical Apparatus

Apparatus	6 Months		12 Months		24 Months	36 Months	Remarks
	Complete	Limited	Complete	Limited	Complete	Complete	
Air circuit breakers (oilless) 11 kv and above					X		or as sch.
Air circuit breakers 11 kv and above	X						
Batteries—storage	X						
Compensators—starting sw. (oil)			X				
Condensers syn and exciters		X				X	
Constant current transformers			X				
Controllers (st. ltg.)			X				
Current transformers (oil filled)			X				
Disconnecting switches (hook or group)			X				or as sch.
Exciters				X	X		
Fire extinguishers (all types)—sand pails		X	X				
Frequency changers and exciters				X		X	
Gang operated air break and disc. sw. opr. mech (motor)			X				
Generators and exciters				X	X		or as sch.
Ladders and step ladders		X	X				
Lightning arresters (electrolytic type)				X		X	
Arresters (dry type) 110 to 220 kv			X				
Metering outfits (oil filled)			X				or as sch.
Mercury power rectifiers		X	X				
Mercury arc rectifiers (st. ltg.)			X				
Motors				X	X		or as sch.
OCB—to 4.4 kv (sta. aux—st. ltg.)			X				or as sch.
OCB—2.3 to 11 kv (attended sta.)					X		
OCB—2.3 to 11 kv (un-attended sta.)				X	X		
OCB Type "H"			X				or as sch.
OCB generators			X				or as sch.
OCB condenser or rotary			X				or as sch.
OCB 11 to 220 kv		X	X				or as sch.
Potential transformers (oil filled)			X				
Protectors (st. ltg.)			X				
Reactors to 11 kv			X				
Reactors 11 to 66 kv			X				
Rectifiers	X						
Synchronous condensers and exciters		X				X	
Trans—industrial locality sub. 0–1,500 kva			X				
Transformers (all others)	X						or as sch.
Voltage regulators (oil)			X				or as sch.

Type of inspection required—refer to maintenance suggestions.
"Or as scheduled"—may be for longer periods; or when heavy duty or frequent operation requires, may be for shorter periods.

Work Rack Speeds Rebuilding of Bushings

RAY JACOT, Substation Dept, Indiana & Michigan Electric Co, Fort Wayne, Ind.

A work rack proved valuable in expediting work and preventing porcelain damage while dismantling and reassembling 15 bushings of the Type OF 138-kv class that had to be completely rebuilt. The rack illustrated was designed and built in the Indiana & Michigan Electric Co's shop. Fabrication of the rack using mostly scrap material cost about $15 and required 16 man-hours.

Structural steel frame has small flanged wheels that ride on the rails entering the substation so that the rack can be placed under a hoist hook or moved wherever desired.

Elevated platform has planked foot space, but the central portion is composed of two sliding steel plates. These plates provide an adjustable circular opening that may be enlarged to lower the bushing without damage, and then closed to support the bushing flange.

A drain pan slides between the channel irons forming the bottom of the rack so that oil will not run onto the floor and cause slipping hazards when the bushing is dismantled.

WORK TABLE was constructed for rebuilding 138-kv bushings during breaker modernization job. Safety railing was removed to show details otherwise not easily visible

A safety railing is always used during normal operations, but was removed, in the illustration, to show clearly the construction of the rack.

3-DIMENSIONAL LIGHTING
For CORRIDORS . . .
An Entirely NEW Concept!

No. C-824

Developed by HOLOPHANE Research

More than just another unit — this new Holophane Luminaire introduces an altogether new approach to corridor lighting. It outmodes the old *wasteful* methods that spread glaring light over passageway floors. Its "three-dimensional" control sends *useful* light in all directions—up to the ceiling and across to the walls, as well as down to the floor. Reflections from these surfaces result in balanced illumination with high visibility. The redirection of light, avoiding the glare area, provides an atmosphere of complete comfort and safety for those in the corridor. With all its advantages in efficiency and low brightness, No. C-824 assures definite economies in installation and maintenance costs . . .

Architects, engineers and contractors are invited to write for complete data, without obligation.

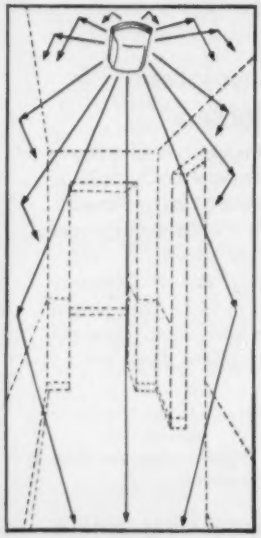


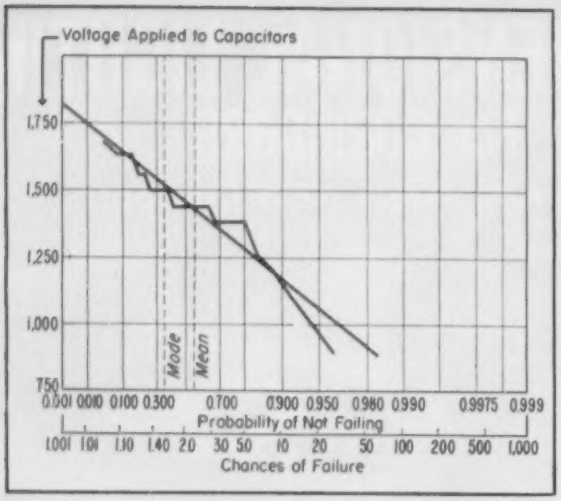
Diagram of Control Features

Holophane

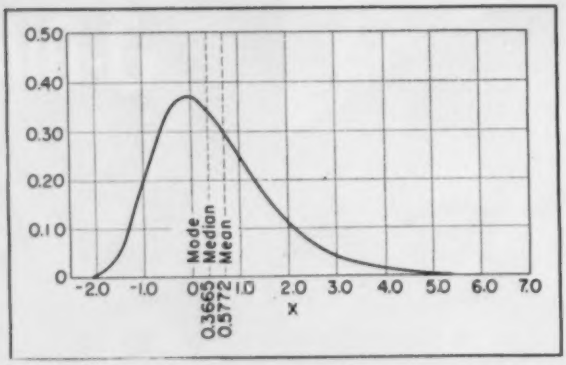
HOLOPHANE COMPANY, Inc.

Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N.Y.

THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO



BREAKDOWN VOLTAGE of capacitors shows that there are 96 chances out of 100 that failure will occur when 1,700 v is applied



LARGEST EXTREME VALUES rise to maximum on one side of mean. Larger values have a greater chance of occurring than do small values

Extreme Value Methods Predict Future Performance

Mathematical treatment of extreme values, both largest and smallest extremes, has been used by National Bureau of Standards to predict future performance. Extreme value techniques are applicable to predicting component failures; tensile strength of materials; and meteorological phenomena such as extreme pressures, temperatures, rainfalls, wind velocities, floods, and droughts.

Normal distribution or bell-shaped frequency curve will not supply required information to predict extreme conditions because largest extremes always tend to push toward higher values. However, if the curve is skewed—rising to a maximum to one side of the mean—larger values have a greater chance of happening than small values.

In using the largest extreme-value method, all the observed maxima are first ranked in order of size. These values are given ranks, i, of 1 to n, counting from smallest to largest. Each observed maxima is then given a probability number, P, according to the relation

$$P_i = \frac{i}{n+1}$$

Observed maxima data and probability numbers are plotted on special extreme-value probability graph paper designed so that the ideal distribution will plot as a straight line. Closeness of plotted points to a straight line is an indication of closeness-of-fit of data to theory.

Special paper is ruled with equal spacing along the ordinate for observed values. The probability scale on the abscissa is marked according to a doubly-exponential formula. Thus, the spacing between 0.001 and 0.500 is much less than half the space between 0.500 and 0.999. Limiting values of 0 and 1 are never reached.

In applying the theory to smallest extreme values, the ranks are assigned from largest to smallest observed values, and the plotted probability-line slope is negative. Droughts, fracturing of material, and breakdown of components are examples of smallest extreme value phenomena.

For breakdown voltage of capacitors, the statistical analysis is based on the theory that every capacitor contains flaws that are conducting particles. The unit breaks down at the voltage passed by the weakest particle.

A plot of experimental data from 25 paper capacitors indicates that with 1,700 v applied the probability of a unit not failing is 0.04, or 96 chances out of 100 that a particular capacitor will fail.

However, if the maximum voltage applied is 900, probability of capacitor not failing is 0.982, or about 2 chances in 100 of failure. From the bottom scale of the graph, 1 unit in 55 should fail with 900 v applied.

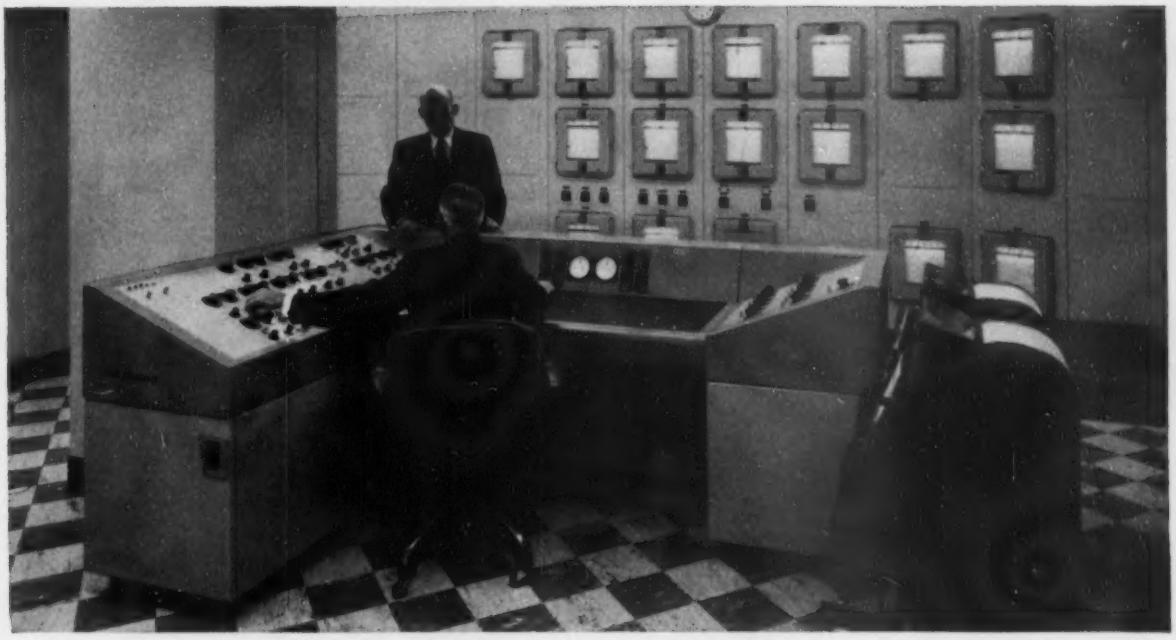
As graphed, the first capacitor to fail, at 900 v, has a probability number, P_m, of 25/26, or 0.962. Other capacitors are assigned probability numbers of $P_{m-1} = 0.923$, etc to $P_1 = 0.385$. On completed graph probabilities are predicted from straight line.

Westinghouse Electric Corp.

DIGGING HOLES is safer when the drive bar is insulated with plastic

Drive-Bar Insulator Protects Workers

Insulating the upper 6 ft of a power digger drive-bar with a piece of plastic tubing protects workmen from accidents that occurred when the drive-bar touched energized overhead wires. California Oregon Power Company secured the tube in place with a split steel band at the lower end. Tube extends about 9 in. above drive-bar.



E. D. Early, Manager of the Southern Company Power Pool, directs operation of the "Early Bird," first incremental cost computer in his Power Supply Coordination Office at Birmingham, Alabama. Mr. Early worked hand-in-hand with L&N during development of the new computer.

He's operating the World's First Incremental Cost Computer For delivered power

The wizardry of electronic computing is now applied to the job of continuously calculating the incremental cost of delivered power. L&N's new computer provides information which immediately permits allocation of generation among generating units so as to bring the incremental cost of delivered power to the lowest possible figure.

The computer can render this service because it considers not just transmission losses, but also incremental generation costs including unit characteristics and fuel costs.

Thus, the new computer master-minds system operating costs by continuously informing you how your power can be most economically generated and distributed, or exchanged. Actual tie-line loads, station outputs and large customer loads are continuously telemetered into the computer—you get an immediate solution to the economic loading problems based on actual system conditions.

Developed jointly by an outstanding utility engineer—E. D. Early, Manager of the Southern Company Power Pool—and the Research and Engineering Staffs of Leeds & Northrup, the computer is a dynamic device embodying the advanced thinking of both power and precision instrument engineers.

Factual performance data on the new computer is now being compiled *on the basis of actual system operating conditions* for the purpose of evaluating its application to similar problems on other power systems. Why not get in touch with us? Write to Leeds & Northrup Co., 4938 Stenton Avenue, Philadelphia 44, Pa.

CALCULATIONS FOR PRELIMINARY DESIGNS of transformers have been simplified at GE's Pittsfield Works by use of an IBM calculator. Time required has been cut over 90%. Data required by engineers for preliminary power transformer designs comes out of the IBM calculator neatly printed on long sheet. Punched cards feed basic facts into machine

CPC Gets Transformer Job

Designers at GE's Pittsfield Works find IBM machine reduces time spent on preliminary-design calculations by over 90%

Most recent of the engineering strongholds to feel the influence of IBM's Card Programmed Calculator is transformer design. Since early January designers have been cranking out preliminary power transformer designs in one hour on the CPC that formerly required 20 to 40 hr "by hand" at General Electric's Pittsfield, Mass, transformer plant.

So far Pittsfield's CPC has been restricted to certain types of "proposition design"—GE's term for the design that forms the basis for customer quotations. GE engineers predict, however, that detailed designs for the majority of Pittsfield's conventional power transformers will eventually be turned out with the CPC. This will reduce design time radically and permit more thorough calculations of hot spots, stray losses, mechanical forces, and the like.

To utilities this application of the digital computer can spell only good news. It means faster delivery of better transformers at lower cost. GE feels the CPC will free designers for more development work that will bring better transformers. Moreover, propositions offered to customers can be given more "thinking" time and attention by the designer, yet be returned faster. This is particularly true when a number of alternatives to the basic inquiry are requested.

High speed and accuracy of the CPC also mean that results of laboratory experiments can be analyzed, developed, and included in designs shortly after the data are available. For example, one statistical analysis of core steel required over a million arithmetical operations. With the CPC only 100,000 operations were needed, providing the answer in five hr instead of six weeks.

Not all the answers that the CPC supplies relate to transformer design. One question often asked by utility operators is: How will the hot-spot temperature of this transformer vary over a 24-hr period if subjected to this particular loading cycle under thus and such an ambient temperature? This answer can now be supplied in less than an hour. Formerly it required eight hr of arduous computations with the help of a few engineering estimates.

Transformer buyers are not the only ones that benefit from the computer. The manufacturer benefits too because the CPC develops better designers. As answers to design problems roll off the CPC, the pace of fundamental decisions by the designer quickens. The designer gains experience faster because he handles more designs.

Service Aids Buyers of Copper and Brass

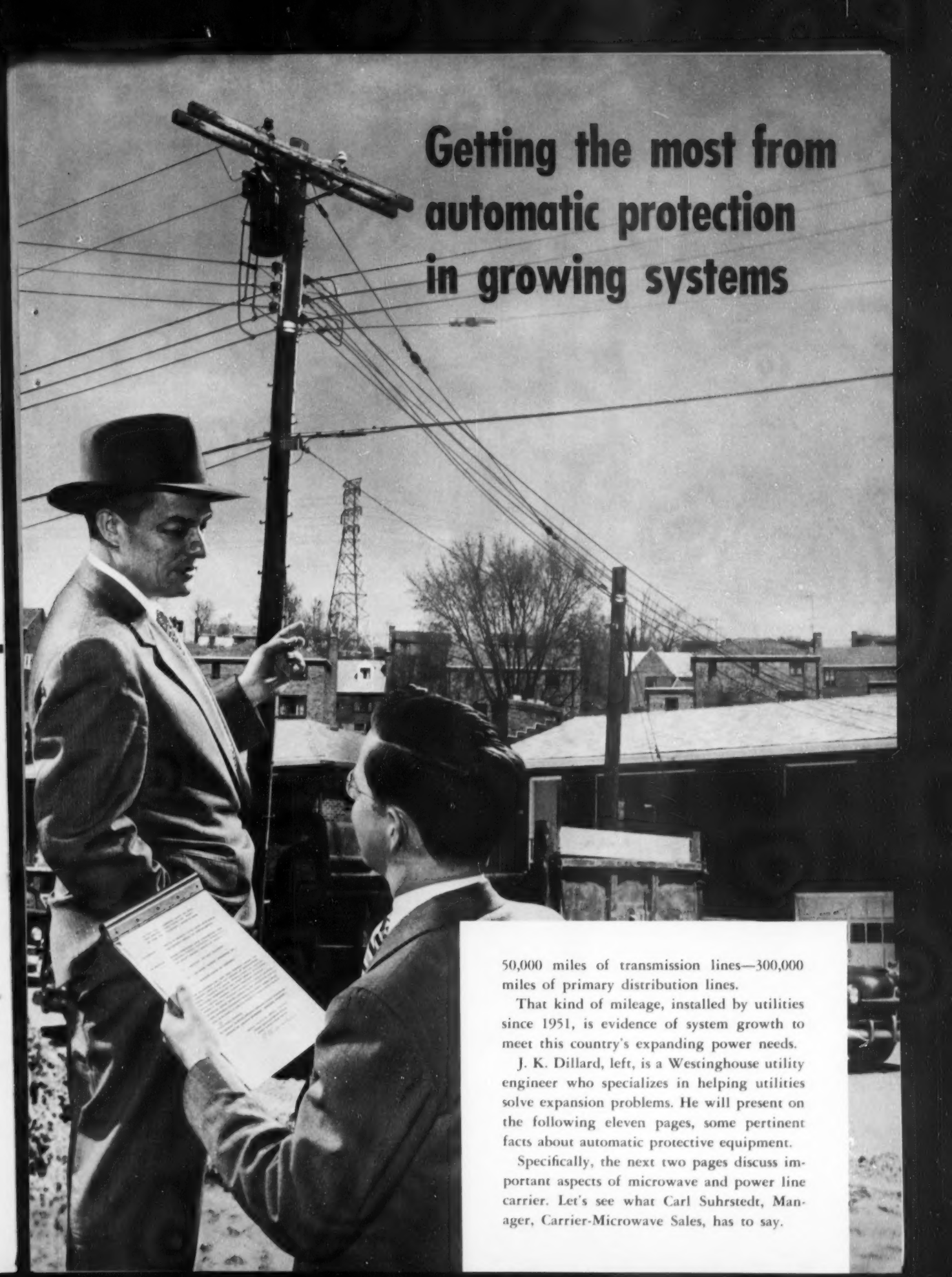
A new, free service that enables a customer to obtain hard-to-get copper and brass material of different shapes and sizes anywhere in the U. S. has been announced by the Copper & Brass Warehouse Association, Inc. The service is expected to ease bottlenecks and cut lead time on production schedules without requiring a premium payment for the item, according to George Proffitt, executive secretary of the association.

Here's how the service works: When a local warehouseman can't supply a particular item, he will call or wire association headquarters. The product will then be listed in a bulletin, and any association member having the product will be asked to wire the warehouseman who needs it. Thus, the entire stock of every member warehouseman in the country is available to other members.

City of Hopkins Lights Up

An installation of 139 four-lamp fluorescent luminaires is to be made in the business district of Hopkins, Minn. It is reported to be one of the largest fluorescent street lighting installations in the United States and is scheduled for completion this autumn.

(*Continued on page* 137)



Getting the most from automatic protection in growing systems

50,000 miles of transmission lines—300,000 miles of primary distribution lines.

That kind of mileage, installed by utilities since 1951, is evidence of system growth to meet this country's expanding power needs.

J. K. Dillard, left, is a Westinghouse utility engineer who specializes in helping utilities solve expansion problems. He will present on the following eleven pages, some pertinent facts about automatic protective equipment.

Specifically, the next two pages discuss important aspects of microwave and power line carrier. Let's see what Carl Suhrstedt, Manager, Carrier-Microwave Sales, has to say.

Carl Suhrstedt (right), Manager of Carrier-Microwave Sales.

Microwave and power line carrier . . . flexible, dependable protection for growing systems

We think you will agree that modern microwave and power line carrier equipment can go a long way toward simplifying the protection problem of today's growing electric systems. Two prime factors in doing this job are flexibility and dependability under all conditions.

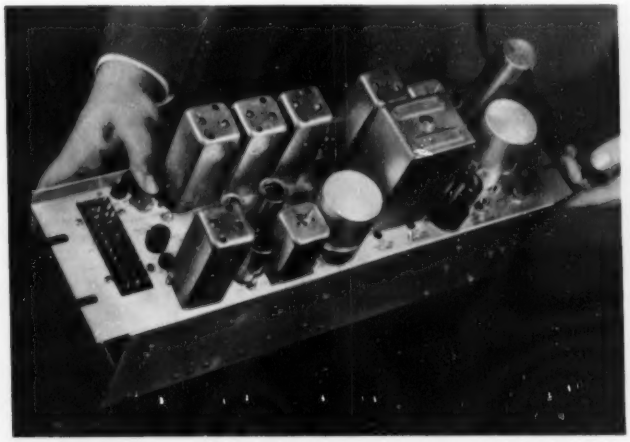
Westinghouse Type FR-FJ 2000 mc microwave is flexible because of its ability to handle your initial needs adequately and accommodate changes and expansion as your system grows. For example, telegraphic units are easily coordinated with protective relaying, telemetering, supervisory control, and all other end-use devices. They can be changed from one function to another with *no* equipment changes, additions or modifications. The FR-FJ microwave offers 30 voice channels, each of which can be used for as many as 15 telegraphic functions. For maximum dependability, multiplex panels are entirely self-contained—even including their own power supply.

Thousands of successful Westinghouse power line carrier installations prove its dependability. Current regulators, an exclusive Westinghouse feature, protect the vacuum tubes from station battery voltage fluctuations—eliminating premature failures. Building block construction provides the flexibility you need for future changes or expansions.

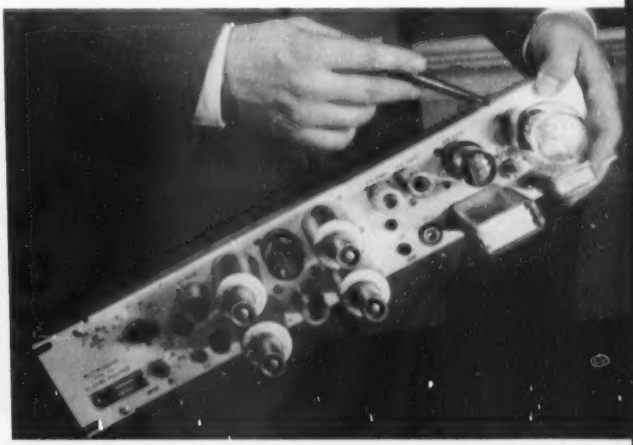
An important added benefit is the fact that Westinghouse not only manufactures both carrier and microwave but also produces a completely coordinated line of end-use equipment.

On the following page, O. C. Green, Relay Design Engineer, reports on a significant relay protection feature.

YOU CAN BE SURE...IF IT'S Westinghouse

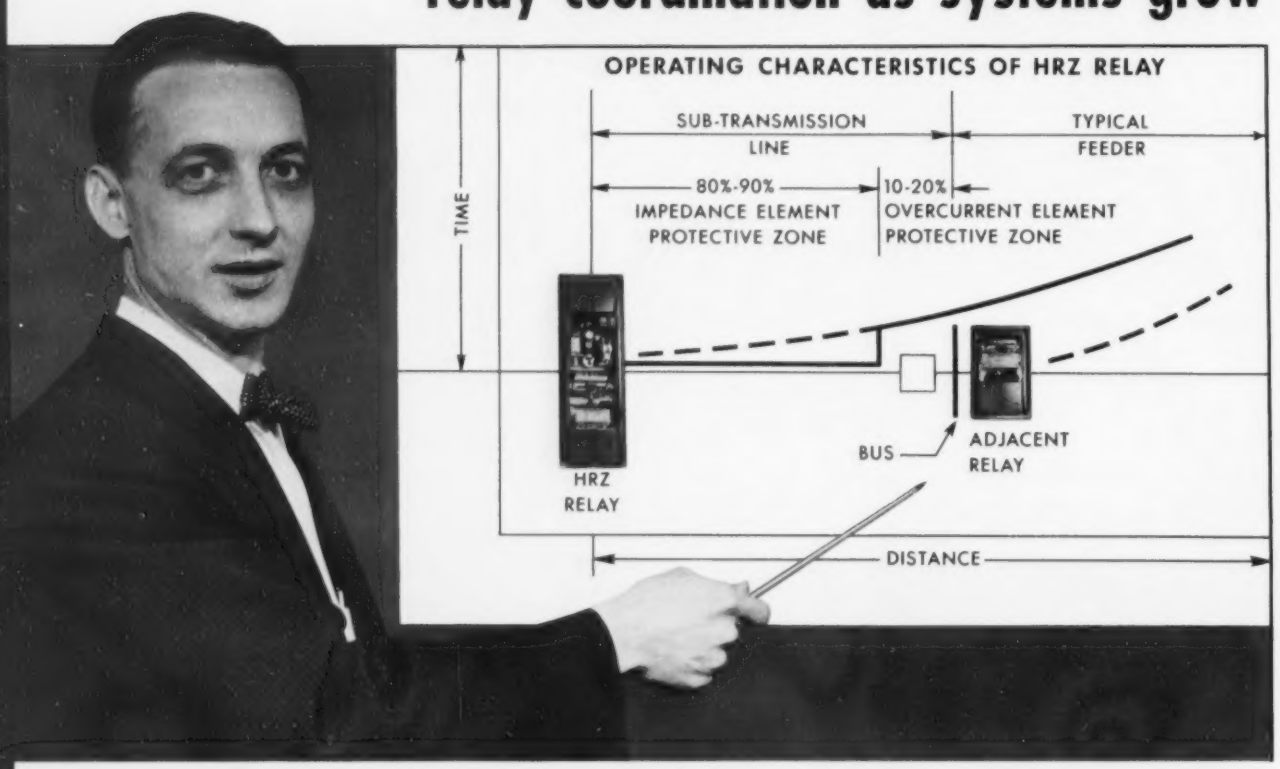


Microwave Type FJ voice band panel. Completely self-contained unit provides a channel independent of all other channels. Panel is adaptable to all types of telephone service and signaling.



Carrier relay receiver includes a current regulator which makes possible use of station batteries without the voltage fluctuations so damaging to vacuum tube efficiency.

New HRZ relay simplifies relay coordination as systems grow



On the chart above, O. C. Green, Relay Design Engineer, shows how the HRZ relay provides the high-speed protection required for transmission lines, yet closely duplicates the time-curve of adjacent overcurrent relays, giving back-up protection without danger of false tripping for faults in the feeder.

As a system becomes larger and more complex, there is a growing need not only for high speed relaying but also for improved coordination between relays installed on sub-transmission lines and those installed on feeder circuits.

To do this, the Westinghouse HRZ relay was developed, combining a high-speed impedance element with an induction disc overcurrent element in a single-phase relay. The impedance element provides instantaneous protection for 80-90% of the line section. Protection for the remaining 10-20% is provided by the overcurrent element. For effective coordination with relays on adjacent sections, the HRZ overcurrent element can be supplied with definite minimum time, inverse or very inverse characteristics. Simplified adjustment on the new "E" design of the overcurrent element assures easy match-up of operating characteristics.

High-speed operation minimizes serious line damage, while selective coordinated operation assures reliable service. The HRZ relay may be applied economically where more expensive equipment cannot be justified. For these reasons, it is especially suitable for addition to growing systems.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Wally Payne (right), Manager of Switchgear Assembly Sales, and J. K. Dillard, Utility Engineer.

Standardized switchgear solves system expansion problems

Westinghouse metal-clad switchgear is designed to minimize or eliminate some of the problems associated with system expansion.

Maximum Service Continuity: Because this switchgear has unitized construction and is standardized in design, additional feeders can be added with minimum outage time. Full service is afforded to existing loads except for the short time required to tie in the main and control buses.

High Level of Protection: Westinghouse metal-clad switchgear components are engineered to work and fit together from the design stage through manufacturing, thus assuring the full coordination necessary for a high level of protection.

Maximum Salvage Value: The load capability of metal-clad switchgear can be readily adapted to accommodate load growth and shifting load centers. The entire assembly can be moved easily, quickly.

There are other benefits to Westinghouse standardized metal-clad switchgear, such as low installation costs, greater safety, pleasing appearance, ease of inspection and maintenance, and others that give you assurance of continuing protection—regardless of your growth pattern.

Speaking of advantages in automatic protection, *Les Livingood of New York State Electric and Gas* and *Bob Ray, Westinghouse Distribution Transformer Sales Manager*, discuss convincing service data on distribution transformers on the next two pages.

Les Livingood (left) of New York State Electric and Gas and Bob Ray, Manager Distribution Transformer Sales.

On this growing system, automatic transformer protection cuts outages 28 to 1

This vastly improved service record, as compared with conventional transformer experience, is being enjoyed by New York State Electric and Gas. It could apply equally well to your growing system. Built-in arresters and protective links, combined with the protection of the breaker built into "CSP"® transformers, are largely responsible.

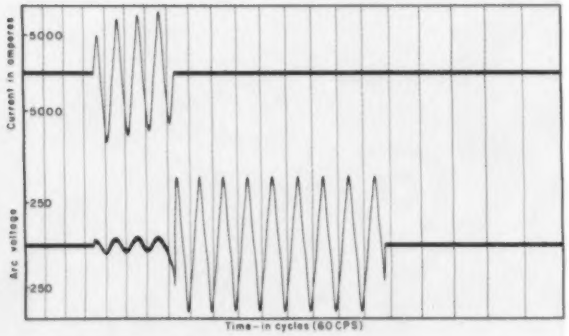
One of the big reasons for the success of the "CSP" transformer is that the breaker is actuated by variations in actual copper temperatures instead of by just oil temperature or magnitude of current. As an integral part of the transformer, it gives your growing system better protection against service outages in two ways:

First, a signal light actuated through the breaker warns that the transformer has reached its maximum safe operating temperature. The signal light thus provides a convenient means of making continuous load surveys. The need for replacement with larger transformers can be recognized long before service outages occur.

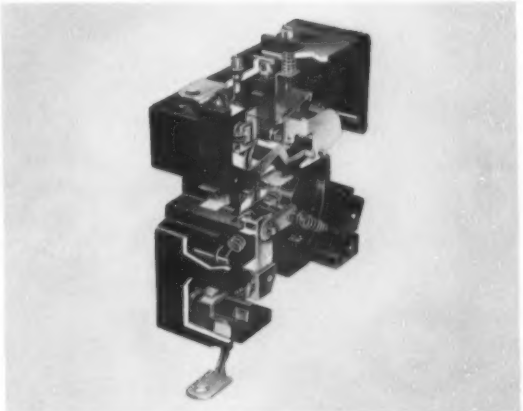
Second, if a serious overload does trip the breaker —service can be quickly restored. No fuses to replace. Unnecessary service trips are eliminated because the breaker will trip out only on those overloads that exceed the transformer's thermal capacity. Nondamaging, short-time overloads are carried.

Built-in LX-T lightning arresters, LR breakers and protective links, all coordinated specifically to the "CSP" transformers to which they are applied, give you complete, automatic protection . . . economically. Plan now to get the extra protection of Westinghouse "CSP" transformers for your system.

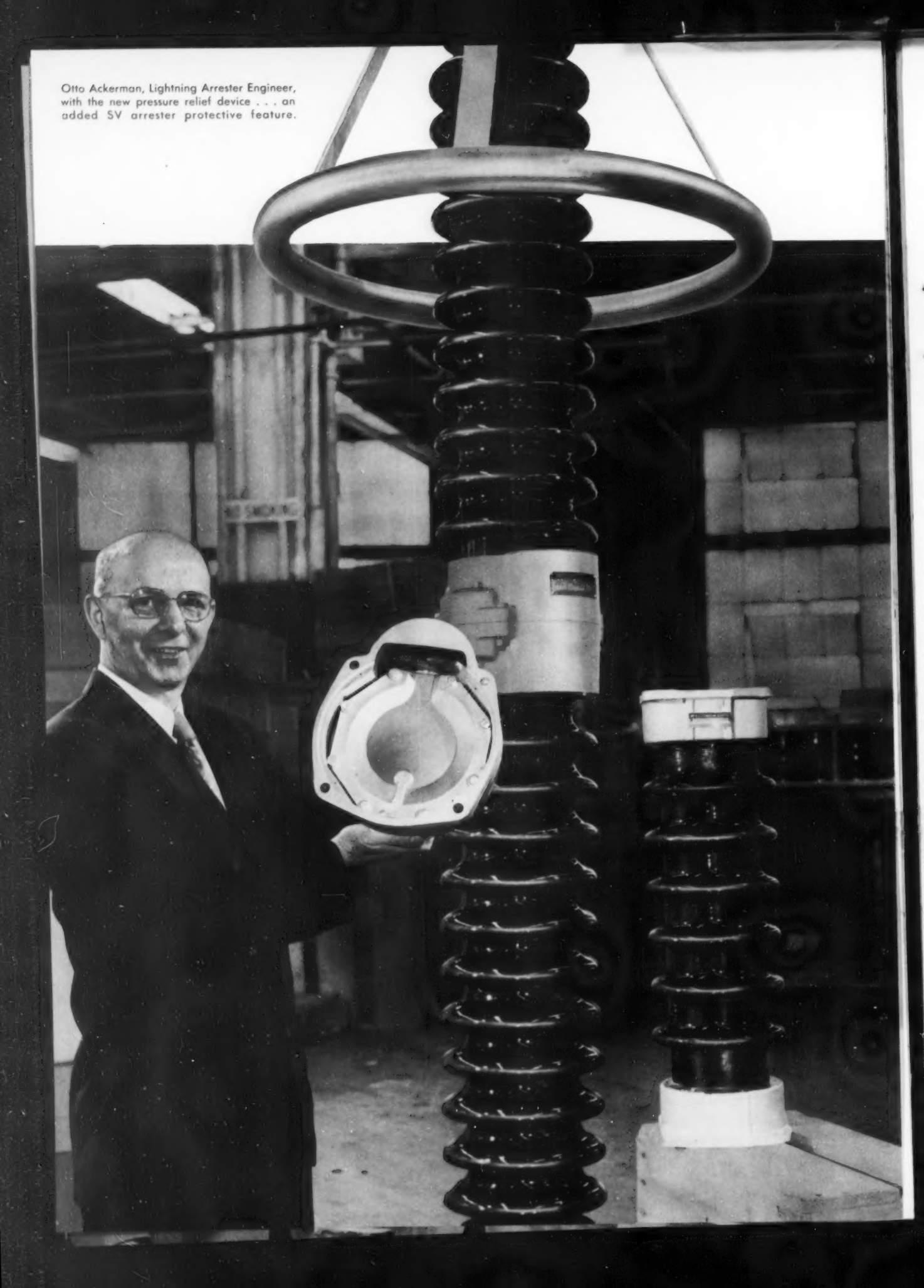
If you're interested in the latest in lightning arrester design, Otto Ackerman, Lightning Arrester Engineer, has something new to show you on the next two pages.



The above oscillogram of a short-circuit test on the LR breaker is typical of its speed in interrupting current with minimum arcing. Consistent interruption of 5000 amps in 4 cycles is high speed protection.



LR breaker cutaway. The controlling factor in the LR is a bimetallic element. The action is determined directly by copper temperature. This is the most accurate means of overload and short-circuit protection available.



Otto Ackerman, Lightning Arrester Engineer, with the new pressure relief device . . . an added SV arrester protective feature.

Proved protection in station and line arresters now greater than ever

Operators have proved to themselves that Westinghouse SV (station) and LVS (line) arresters have high protection capability. Recent new features offer your system even greater protection—without changing the proved basic design. Here's how:

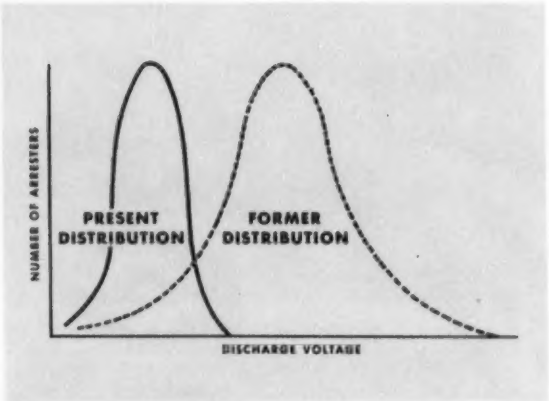
New Pressure Relief Device in the SV arrester eliminates the possibility of an internal short circuit ever causing gas pressures to rise high enough to burst the porcelain—with resulting danger to adjacent equipment. This is accomplished by a unique diaphragm and gas venting system which instantly transfers the gas outside the arrester—before the porcelain can burst.

Lower Discharge Voltages give you the greatest protective margins available in high-capacity arresters. (See charts below.) This was achieved through improvements in the entire sequence of Autovalve® block manufacturing and test procedure.

Lower Impulse Spark-over values for the LVS have been accomplished without reducing the 60-cycle sparkover values. The proper balancing of these two values assures you of protection and a safe margin for clearing follow currents.

There are many other proved features of Westinghouse SV and LVS arresters such as an exclusive moisture-proof solder seal and aluminum alloy end castings which add up to the best protection available for your growing system.

For a discussion by *Jack Stirling* of the *Switchgear Division* on the outstanding Type AA mechanisms, turn the page.



These curves show the comparison of former and present distribution of the discharge voltages of Autovalve lightning arresters. Note the reduction in limits, resulting in lower discharge voltage characteristics throughout.

Maximum discharge voltages, kv crest, for the following discharge currents in amperes crest, 10 x 20 microseconds

Arrester Rating Kv Rms	1500	5000	10000	20000	100000
			SV ARRESTERS		
12	29	34	37	40	50
30	73	85	93	100	125
73	178	206	225	245	305
195	475	550	595	645	810
			LVS ARRESTERS		
12	35	41	45	50	
30	86	101	112	124	
73	220	262	290	320	

This table shows you how maximum discharge voltages of Westinghouse SV and LVS arresters have been lowered to give you the greatest protective margins available in high-quality arresters.

YOU CAN BE **SURE**...IF IT'S Westinghouse

Jack Stirling, Manager Power Circuit Breaker Sales, looks over a 25,000,000-kva Watchcase* breaker—the world's largest. A single AA-14 pneumatic mechanism operates all three poles—provides 3-cycle opening, 20-cycle reclosing.

*Trade Mark

Type AA pneumatic mechanisms—better, faster breaker operation

In every way, Westinghouse Type AA pneumatic mechanisms are meeting the need, *better*—for the high interrupting capacity—high speed breaker operation demanded by system growth and interconnections.

They are better because:

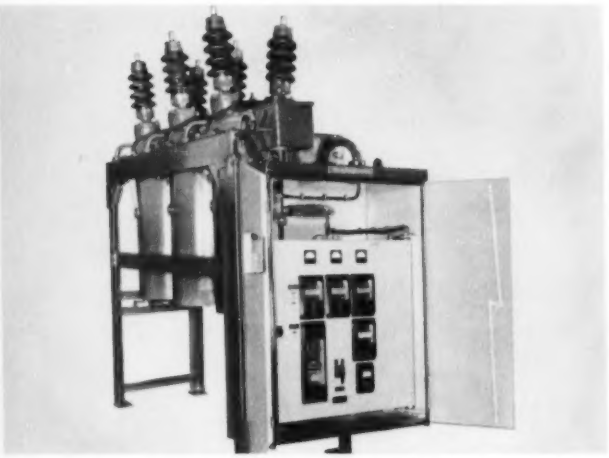
- **They are mechanically trip-free in all positions.**
- **They operate at low air pressures—70 to 270 psi.**
- **Operating accessories are time-proved in this pressure range.**
- **A single mechanism operates 3 poles simultaneously.**

An exclusive trip selector is the key to the high speed breaker operation—*under all conditions.* It provides, automatically, either mechanically trip-free or nonmechanically trip-free operation, depending on whether or not there is compressed air in the cylinder. This assures non-retarded opening at all times, initially, following a closure, or when closed in on a fault. This unique selector also provides ultra-high-speed reclosing without hammering of oppositely moving parts in either the breaker or the mechanism.

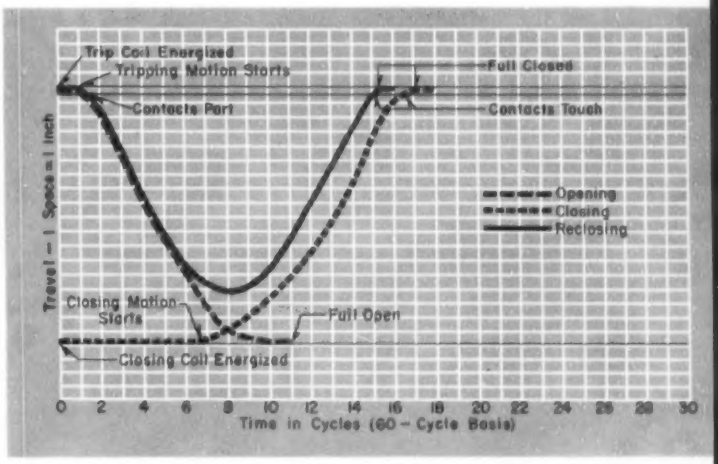
Operating accessories such as pressure switches, valves and compressors have been perfected in over 15 years of Westinghouse experience with pneumatic mechanisms. This, coupled with the low operating pressure, insures long, maintenance-free service.

The simultaneous operation of all *three* breaker poles by one mechanism is characteristic of the three Westinghouse Type AA mechanisms—AA-7, AA-10, AA-14. This greatly simplifies high-speed relaying schemes.

These outstanding pneumatic mechanisms attest to this fact: no matter how large your future loads or how difficult your operating requirements may be, you can count on Westinghouse to provide the circuit breakers to handle them.



An AA-7 pneumatic mechanism operates this 34.5-kv breaker. Protective and reclosing relays, mounted on a hinged panel, may be mounted in the housing to provide completely automatic operation.



This chart shows typical opening, closing, and reclosing performance of high voltage breakers using a Type AA-10 mechanism. Note the smooth reversal of travel on the reclosing operation.

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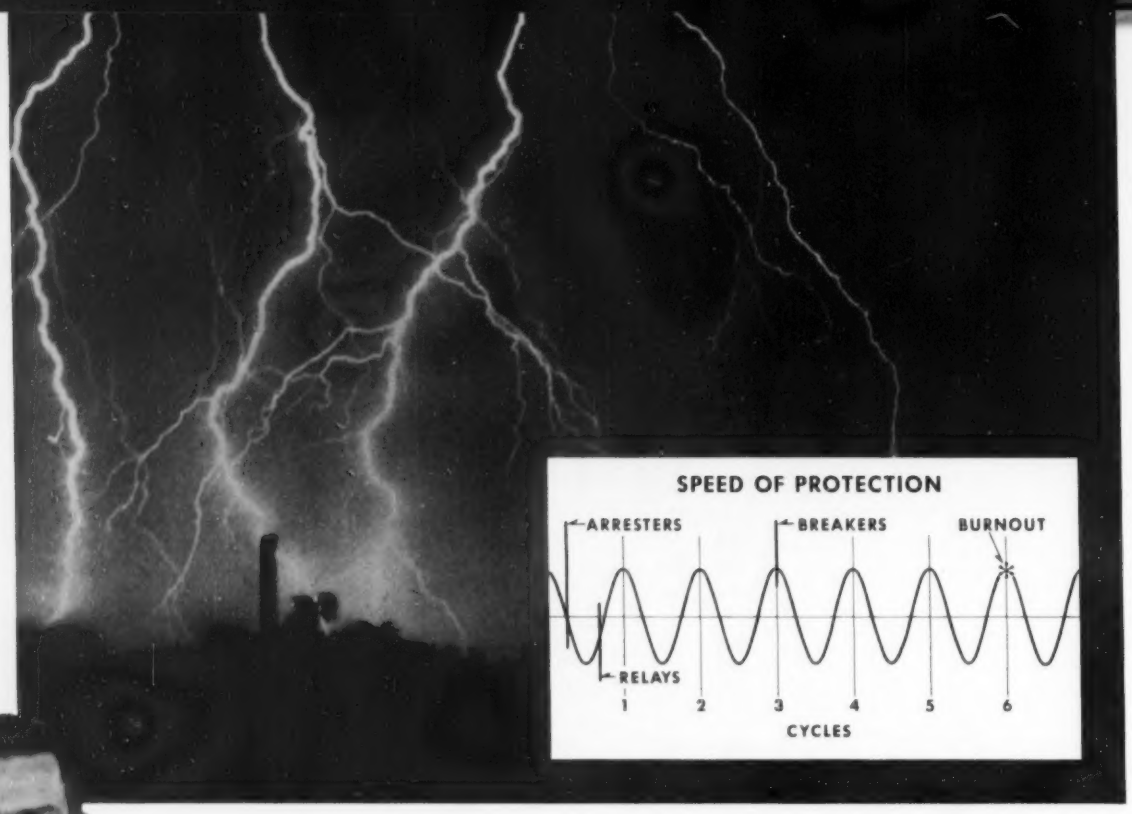


Speed—its importance to today's systems

We all agree that speed of protection is essential to modern electric utility systems—particularly under conditions of high transmission and distribution voltages. Perhaps we take it too much for granted.

A 10-million-kva fault at 138 kv, for instance, contains 41,000 amperes and can burn a line down in approximately six cycles or less. Less dramatic, *but vital,* is the fact that Westinghouse circuit breakers open within 3 cycles after a trip signal.

Even faster, Westinghouse high-speed relays trip for heaviest faults *in less than one cycle.* Or, faster yet, Westinghouse lightning arresters do their job in one ten-thousandth of a second after lightning strikes!

When you stop to think about it, speed is important to your system. It's a prime objective for Westinghouse research engineers. They work constantly toward even greater speed in Westinghouse equipment. You can be assured that as your needs grow, Westinghouse will be in a position to meet them.

CP-1020

YOU CAN BE SURE...IF IT'S

Westinghouse

There's more detailed information available . . .

by getting in touch with your nearby Westinghouse representative. Or, if you prefer, write direct to Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa. Product booklet reference numbers are as follows:

- ☐ Microwave—Power Line Carrier B-5873, B-5850
- ☐ HRZ Relays ..... IL 41-421.1
- ☐ Power Circuit Breakers B-5904
- ☐ Metal-clad Switchgear B-5306-A
- ☐ CSP Distribution Transformers B-4249A

CP-1020

Hopkins Lights Up

(*Continued from page* 124)

The new lighting system is being paid by business men and Line Material Co is furnishing the luminaires. Northern States Power Co, which supplies power to Hopkins, will maintain the lighting system under a contract arrangement.

Five U S Firms Bid For Usina Generators

SAO PAULO (McGraw-Hill World News)—Five U. S. manufacturers were among 25 firms, representing eight countries, that bid to supply equipment for the third and fourth units of the Usina de Salto Grande, a hydroelectric plant. The units will increase plant capacity to 140,000 hp.

Proposals to furnish hydraulic turbines were made by 13 manufacturers including Allis Chalmers Manufacturing Co, S. Morgan Smith Co, Baldwin-Lima-Hamilton Corp, and firms in Canada, France, Italy, Switzerland, Germany, and Sweden.

Bids to supply the generators were made by Allis Chalmers Manufacturing Co, International General Electric, Westinghouse International Co, and a total of 11 other companies in Sweden, Switzerland, Germany, Belgium, Italy, and France.

British firms were invited to bid but were unable to present proposals because their delivery schedules went beyond the time stipulated. Equipment must be in Brazil before 1956.

MANUFACTURING BRIEFS

Sangamo Electric Co's 100,000 shares of common stock were sold quickly at $25 per share by Hornblower & Weeks group.

Burroughs Corp, Detroit, has acquired Haydu Brothers of New Jersey, Plainfield, N. J. This acquisition will provide Burroughs with manufacturing facilities for production of electronic tubes and components. The plant will continue operations under George K. Haydu as general manager.

Copper . . . Suspension of the import tax on copper was continued for one year to June 30, 1955, along with safeguards should the price drop to 24¢ for a calendar month.

Westinghouse Electric Corp has been awarded a $2,116,252 contract for installation of two additional generators at Chief Joseph Dam on the Columbia River. The English Electric Export Co figured low April 15 at $1,946,450. Westinghouse previously had contracts for eight generators at Chief Joseph. Westinghouse also received $835,938 award for two generators at The Dalles on the Columbia River. The British firm bid $815,393. Elin Corp of Austria bid $533,185 and Pacific Oerlikon Co of Switzerland bid $699,735, but both were disqualified.

Birmingham Exchange and Engineering Center, Birmingham, Eng., has been established to supply information about British metal-using, ma-

MANUFACTURERS' EARNINGS

Company	Period Months Ended		Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Baldwin-Lima-Hamilton	6	June 30	$2,090,851	$3,896,997	$0.49(a)	$0.81(a)
Driver-Harris Co	3	June 30	94,231	169,286	1.05	1.90
General Electric Co	3	June 30	45,827,000	41,568,000	0.53	0.48(b)
General Electric Co	6	June 30	93,856,000	75,417,000	1.08	0.87(b)
Johns-Manville Corp	3	June 30	5,435,663	6,413,358	1.71	2.02
Johns-Manville Corp	6	June 30	8,028,069	11,356,849	2.53	3.58
Minn. Honeywell Regulator	3	June 30	3,069,439	2,827,509	0.98(a)	0.86(a)
Minn. Honeywell Regulator	6	June 30	7,019,778	4,901,651	2.25(a)	1.63(a)
Okonite Co	6	June 30	511,413	1,500,626	3.01(a)	9.39(a)
Orangeburg Mfg Co	24 wk	June 30	329,427	305,131	1.98	1.92
Owens-Corning Fiberglas	6	June 30	3,639,053	3,110,178	1.16	0.99
Remington Rand Inc	3	June 30	3,307,518	3,114,280	0.63	0.59
Remington Rand Inc	6	June 30	7,048,132	5,858,546	1.35	1.11
Revere Copper & Brass Co	6	June 30	4,924,790	4,982,470	3.82	3.87
Shell Oil Co	3	June 30	30,238,395	25,211,719	1.10	0.92(b)
Shell Oil Co	6	June 30	63,435,549	50,744,359	2.31	1.85(b)
Sylvania Electric Products	3	June 30	1,401,298	2,395,849	0.41	0.78(c)
Sylvania Electric Products	6	June 30	3,522,785	5,169,092	1.08	1.70(c)
Union Carbide & Carbon	3	June 30	20,359,433	26,783,480	0.70	0.93
Union Carbide & Carbon	6	June 30	41,803,203	52,478,580	1.44	1.82
Worthington Corp	6	June 30	3,543,285	3,098,499	3.05	2.70

Notes—(a) On shares outstanding at close of respective periods. (b) Based on shares now outstanding. (c) Adjusted to reflect 10% stock dividend distributed last December.

what's NEW in Engineering

A new free-hand electric bandsaw is said to cut through metals "like a knife through butter". It is light enough (16 pounds) to be used free-hand in any position, and the power driven unit is claimed to be the first completely portable unit of its kind. Slightly larger than a hand hacksaw, it is about 15 times faster.

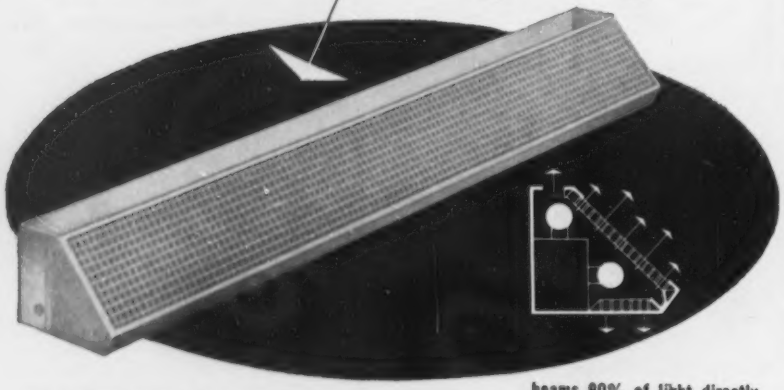
On Puget Sound at Steilacoom, Kaiser Engineers designed and recently completed one of the nation's most modern aggregates plants to supply the growing demand for sand and gravel in the Pacific Northwest. A unique feature of the plant's

construction was the erection of serpentine walls in the sand and gravel storage areas to eliminate dead space. The new plant's flexibility of operation is such that it not only can handle most common sizes of gravel, but also any other specific sizes ordered by customers. Its crushing and screening capacity is 375-500 tons per hour.

Conditioning of Water for Industrial Use is the title of a new book, written by Sheppard T. Powell being published by McGraw-Hill this month. This modern guide to water conditioning describes the various types of apparatus in detail, including design features, control required for efficient performance, cost of installation and operation and other pertinent information.

Whether it's designing an oil refinery, building a manufacturing plant or laying out a plant site, Kaiser Engineers undertakes the job with assurance because of the variety of talent within the organization. Successful experience in a wide field of design, engineering and construction tells the story. Call or write: Kaiser Engineers, Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

a brand new slant on cove lighting



GUTH GRATELITE* LUMINOUS COVE

(the 2-in-1 bracket) (TM Pats. Pend.)

An exciting new look. Sparkling—like a superb diamond! Classic beauty and workmanship in the Guth tradition. ***It's the new*** fashion in Cove lighting made possible by GRATELITE: low brightness, high efficiency, excellent diffusion, low upkeep.

LOOK! YOU CAN TURN IT OVER, TOO!
Mounted "upside-down"—it solves dozens of tricky lighting problems where downward and outward beams are needed.

Write on your letterhead today for Bulletin 929-H.

*U. S. & Can. Pats. Pend. TM Reg.

beams 80% of light directly upward and outward!
beams 20% of light downward to brighten side walls!
perfect shielding in 45° x 90° zones by GrateLite!

as luminous indirect cove

in fitting room

in barber shops

over hospital bed

chalkboard downlite with cove

Guth

THE EDWIN F. GUTH CO. • ST. LOUIS 3, MO.

Leaders in Lighting Since 1902

chinery, and electrical industries. Product displays of over 200 firms, catalogs of another 7,000, and advice about the firms' capacity and capabilities are available. Christopher J. Grazebrook is president of the center.

S. Morgan Smith Co has a completely self-contained master exhibit unit that will be used by the Turbine Division and Valve Division sales departments to display equipment at trade exhibits. Attractive booth spaces with frontages from 20 to 40 ft can be easily set up with the unit, requiring no rented properties or display materials.

Franklin Electric Co, Inc, manufacturer of electric motors, has placed contracts for an addition to its main plant at Bluffton, Ind. The 48,000-sq ft addition will double the plant size and provide employment for up to 1,000 workers.

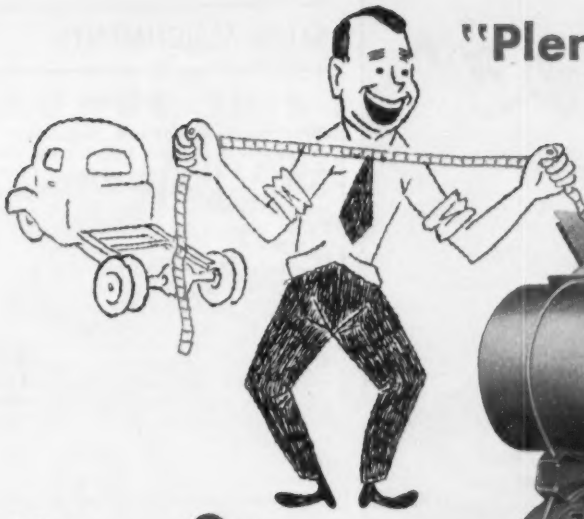
American Elin Corp submitted an apparent low bid of $1,174,745 to the Seattle Board of Public Works for furnishing and installing a generator at Ross Dam. The corporation promised installation in 730 days, equaled only by General Electric Co, high bidder at $2,135,812.

Robertshaw-Fulton Controls Co announced that its Canadian subsidiary has acquired a 30,000-sq-ft plant in the Toronto area, on a long term lease. Manufacturer of thermostatic controls for kitchen ranges, water heaters, and space heaters is planned for this summer.

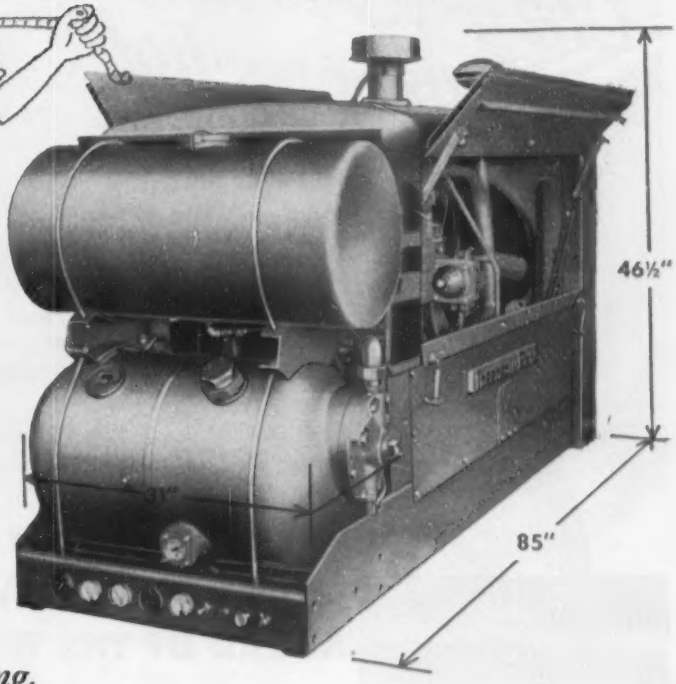
Pyle-National Co, manufacturer of electrical and air-conditioning equipment, has formed a plastics division for the development and sale of fibreglass reinforced polyester resins. Robert R. Clark has been appointed manager of the division.

Babcock & Wilcox Co has contracted to furnish two heat exchangers for the United States' first full-scale nuclear power plant. The contract is with Westinghouse Electric Corp, which is responsible for the nuclear portion of the project that will be operated by Duquesne Light Co.

Labor . . . Louis Allis Co and IUEW-CIO signed a two-year contract raising employees wages by 4¢ to 14¢ per hr, and provides for a wage reopener after a year.



"Plenty of room left for tools and men too!"



New

GYRO-FLO ROTARY COMPRESSOR

...smallest, lightest, 125 cfm unit ever built for truck-mounting.

The self-contained GYRO-FLO 125 occupies a mere 70 cu ft of space and weighs only 2000 pounds. It is 51% smaller and 35% lighter than Ingersoll-Rand's former 105 cfm reciprocating model.

You can mount it on lighter, less costly, standard trucks for highly mobile service units. For traveling workshops, its extreme compactness allows maximum space for tools and personnel.

Only 7'1" long, this 125 compressor can easily be placed crosswise directly behind the driver's cab. It is built to conform readily to vehicle width limitations — with plenty of pipe carrying space available at the side. The control panel is conveniently located under the receiver at the curb end of the compressor.

The GYRO-FLO delivers full rated 125 cfm of compressed air at 100 psi. Having its own engine, the compressor can be removed and operated independently of truck.

- Other GYRO-FLO models include 125 and 210 cfm units on 2 wheel mounting, 210, 315 and 600 cfm on 4 wheels. GYRO-FLO's have no compressor valves to leak — no pistons, rings, rods or clutch to wear out. Discharge pressures are held between 100 and 110 psi throughout the entire capacity range of the machine. This means maximum efficiency in the operation of rock drills and air tools. And discharge temperatures are at least 100° lower than other compressors, assuring longer air-hose life.

There is a GYRO-FLO for your every portable compressor need — and your nearest I-R branch office will be glad to advise you on your particular problem.

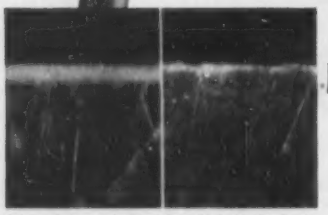
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

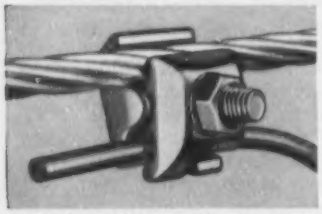
E-29

COMPRESSORS • ROCK DRILLS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

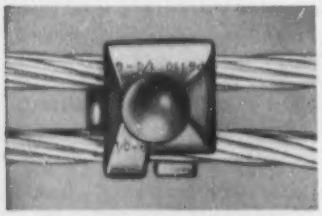
Protect your conductor with THE CLAMP THAT'S AHEAD OF THE TREND



Micro-photograph shows how high-density fortified cadmium, applied to a thickness of .001" on Chance AGP Clamps, compares with commercial plating at right.



Overlapping contacts on one side and a straight slide-in groove on the other help the attachment of the tap to the line.



Top view of clamp shows extra wide gripping jaws that contact all outside conductor strands in the entire size range.

Connecting copper and aluminum conductor requires a general purpose connector as good as the conductor itself in conductivity, mechanical stability and corrosion resistance, if future trouble on the line is to be avoided.

The best connector for this purpose is an aluminum bodied clamp with a *properly applied coating* of high density, fortified cadmium, proved best by every test for long-lasting, troublefree, general purpose connections.

That's what you get in the New Chance AGP Parallel Groove Clamp, companion to the widely tested and accepted Chance AGP Tap Clamp. The Chance PG110, shown above, can be used for any combination of aluminum or copper in a size range 1/0 ACSR to No. 6 copper *both sides*. This clamp is heavy in construction—yet light in weight. The high tensile strength bolt swivels into position without binding or bending. The wide jaws of this clamp contact every strand of any conductor in the entire size range. Rounded edges protect the conductor against damage from vibration.

Chance PG110 is your universal clamp for most applications. Larger sizes with the same features are also available. Write for complete information.

**Aluminum General Purpose*

ABC INDUSTRIES

A·B·CHANCE CO·

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA

CC59-11

SALES ASSIGNMENTS

COMPANY STAFFS

Minneapolis-Honeywell Regulator Co has named R. B. Grant Los Angeles branch manager. He joined the company 14 years ago and since 1949, he has been regional industrial manager for the company's Pacific region.

Nordberg Manufacturing Co has appointed Marvin Wall as district manager of the Heavy Machinery Division and R. C. Gamble as sales engineer for the Dallas territory. Wall will take care of Oklahoma, New Mexico, and north and central Texas, while Gamble will assist in field engineering and the sale of Nordberg's line of heavy duty engines ranging up to 10,800 hp in the Dallas area.

MEETINGS CALENDAR

Pan-American Federation of Engineering Societies
(UPADI), Third Convention, Sao Paulo, Brazil, Aug. 2-12.

***Southeastern Electric Exchange**
Personnel Administration Section, Grove Park Inn, Asheville, N. C., Aug. 19-20; Engineering and Operation Section, Thomas Jefferson Hotel, Birmingham, Ala., Sept. 23-24; Accounting Section, Roanoke Hotel, Roanoke, Va., Oct. 21-22; General Sales Conference, Roosevelt Hotel, New Orleans, La., Oct. 28-30; Accident Prevention Committee, Heidelberg Hotel, Baton Rouge, La., Nov. 11-12; Annual Meeting, Boca Raton Hotel and Club, Boca Raton, Fla., Mar. 21-23, 1955; Engineering and Operation Section, Roosevelt Hotel, New Orleans, La., April 7-8, 1955.

International Electrotechnical Commission
50th Anniversary Meeting, University of Pennsylvania, Philadelphia, Sept. 1-16.

American Society of Mechanical Engineers
Fall Meeting, Schroeder Hotel, Milwaukee, Sept. 8-10; Annual Meeting, Statler Hotel, New York, Nov. 28-Dec. 3.

Rocky Mountain Electrical League
Annual Fall Convention, Stanley Hotel, Estes Park, Colo., Sept. 12-15.

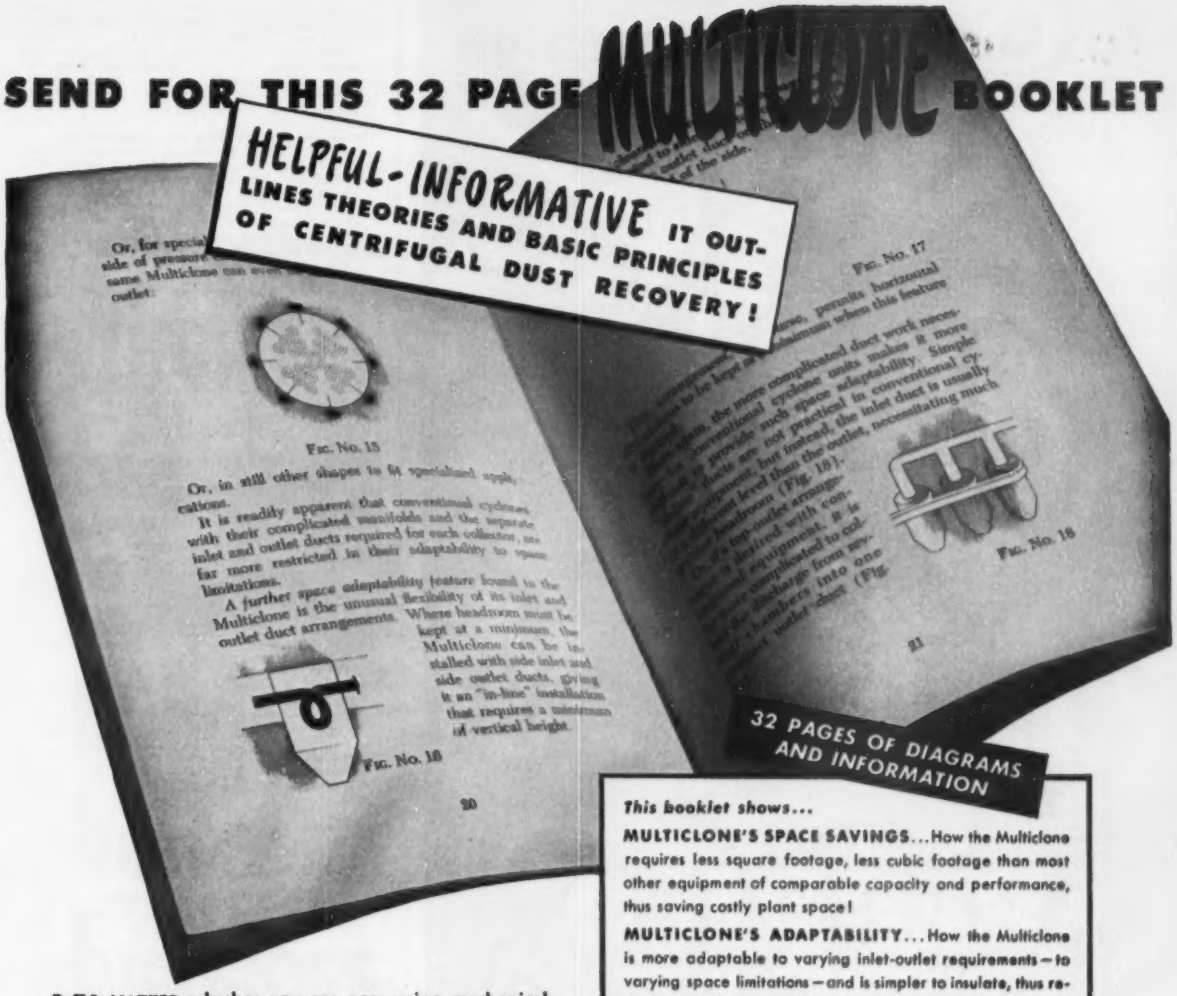
Illuminating Engineering Society
National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., Sept. 13-17.

***Pennsylvania Electric Association**
47th Annual Meeting and Business Conference, William Penn Hotel, Pittsburgh, Sept. 14-15; Fall Meeting, Systems Operation Committee, Alexander Hotel, Hagerstown, Md., Oct. 7-8; Fall Meeting, Relay Committee, Hotel Alexander, Hagerstown, Md., Oct. 14-15. Fall Meeting, Electrical Equipment Committee, Hotel Robert Treat, Newark, N. J., Oct. 19-20.

Public Utilities Association of Virginias
36th Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Sept. 16-18.

***Edison Electric Institute**
Accident Prevention Committee, Benjamin Franklin Hotel, Philadelphia, Sept. 20-21; Industrial Relations Committee, Round Table Conference, Palmer House, Chicago, Sept. 27-29; Meter and Service Committee, Leland Hotel, Springfield, Ill., Sept 27-29; EEI-AGA Tax Committee, Brown Palace Hotel, Denver, Colo., Sept. 29-Oct. 1; Prime Movers Committee, De Witt Clinton Hotel, Albany, N. Y., Oct 4-5; Area Development Workshop, Hotel Statler, Cleveland, Ohio, Oct. 7-8; Transmission and Distribution Committee, Sir Francis Drake Hotel,

SEND FOR THIS 32 PAGE MULTICLONE BOOKLET


HELPFUL-INFORMATIVE IT OUTLINES THEORIES AND BASIC PRINCIPLES OF CENTRIFUGAL DUST RECOVERY!
Fig. No. 15
Or, in still other shapes to fit specialized applications.
It is readily apparent that conventional cyclones with their complicated manifolds and the separate inlet and outlet ducts required for each collector, are far more restricted in their adaptability to space limitations.
A further space adaptability feature found in the Multiclone is the unusual flexibility of its inlet and outlet duct arrangements. Where headroom must be kept at a minimum, the Multiclone can be installed with side inlet and side outlet ducts, giving it an "in-line" installation that requires a minimum of vertical height.
Fig. No. 16
20
Fig. No. 17
Fig. No. 18
21
32 PAGES OF DIAGRAMS AND INFORMATION

This booklet shows...

MULTICLONE'S SPACE SAVINGS...How the Multiclone requires less square footage, less cubic footage than most other equipment of comparable capacity and performance, thus saving costly plant space!

MULTICLONE'S ADAPTABILITY...How the Multiclone is more adaptable to varying inlet-outlet requirements—to varying space limitations—and is simpler to insulate, thus reducing installation costs!

MULTICLONE'S EFFICIENCY...How Multiclone's multiple *small diameter* tubes, made possible by its exclusive vane design, give higher centrifugal forces and more complete cleansing of *all* suspended particles—even small ones of 10 microns and less!

MULTICLONE'S LOW MAINTENANCE...How the Multiclone has no high speed moving parts to repair or replace, no pads or filters to clean or renew, nothing to choke gas flow or increase draft losses as suspended materials are recovered. Multiclone draft losses remain uniformly low—recovery efficiencies uniformly high—at all times!

Make sure that a copy of this helpful booklet is in your reference files by sending for your copy now!

NO MATTER whether you are now using mechanical dust recovery equipment or are planning the installation of such equipment at some future date, here is a booklet that is full of helpful and valuable information on centrifugal dust recovery. It not only explains the basic methods and principles involved, but also shows the important differences between small and large diameter separating tubes, shows how to simplify your duct work and reduce installation costs, and outlines many other important factors to be considered in selecting mechanical dust recovery equipment.

In addition, this informative booklet illustrates and explains how MULTICLONE'S unique *vane* design is fundamentally different...how it makes possible greater compactness, simpler installation, high recovery of the small particles as well as the medium and coarser ones, and many other facts on MULTICLONE advanced design.

A limited supply of these booklets is available for free distribution to those interested in mechanical recovery equipment and methods. Write for your copy today.

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COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers

...in all parts of the U. S. A. and foreign countries

WESTERN Precipitation CORPORATION

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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BERMICO®

LIFETIME CONDUIT

With Bermico Lifetime Conduit you get the greatest possible protection for your cable—at low cost. That means fewer outages, uninterrupted service for your customers, and less expense for you.

Made from sturdy wood fibre, impregnated with pitch, Bermico is *completely uniform* from end to end. For the best protection for your cable specify Bermico. It's light, tight, strong, waterproof, acid-resistant, with smooth bore.

All Westinghouse Electric Supply Company offices are equipped to give you prompt, efficient service. They carry, for immediate shipment, large, well-balanced stocks of all sizes, together with fittings for any situations you may encounter in installing underground ducts.

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San Francisco, Calif., Oct. 7-8; Electrical Equipment Committee, Hotel Statler, Hartford, Conn., Oct. 11-12; Industrial Relations Committee, in conjunction with North Central Electrical Association, Minneapolis, Minn., Nov. 18-19; Prime Movers Commitee, Astor Hotel, New York, Nov. 29-30.

***Missouri Valley Electric Association**
Accounting Conference, Jefferson Hotel, St. Louis, Mo., Sept. 23-24; Sales and Rural Conference, President Hotel, Kansas City, Mo., Oct. 6-8; Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 3-4, 1955; Engineering Conference, President Hotel, Kansas City, Mo., March 23-25, 1955.

***American Institute of Electrical Engineers**
Committee on Petroleum, Conference on Electrical Applications in Petroleum Industry, Mayo Hotel, Tulsa, Okla., Sept. 27-29; Middle Eastern District Meeting, Abraham Lincoln Hotel, Reading, Pa., Oct. 5-7; Fall General Meeting, Morrison Hotel, Chicago, Oct. 11-15; Winter General Meeting, Hotel Statler, New York, Jan. 31-Feb. 4, 1955.

***International Association of Electrical Leagues**
19th Annual Conference, Bellevue-Stratford Hotel, Philadelphia, Pa., Sept. 29-Oct. 2.

***Institute of Radio Engineers**
Professional Group on Industrial Electronics and Pittsburgh Section of IRE Symposium, Mellon Institute, Pittsburgh, Pa., Sept. 29-30.

National Electronics Conference
10th Annual Conference, Hotel Sherman, Chicago, Oct. 4-6.

National Association of Electrical Distributors
Pacific Zone Convention, Mark Hopkins Hotel, San Francisco, Oct. 4-7.

Indiana Electrical Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 6-8.

Interstate Power Club
Meetings will be held at Hotel Martinique, New York, on following dates: Oct. 11, Dec. 6.

***Controllers Institute of America**
Annual Meeting, Edgewater Beach Hotel, Chicago, Ill., Oct. 10-13.

Oklahoma Utilities Association
Electric Light and Power Division, Western District Meeting, Duncan, Okla., Oct. 21; Eastern District Meeting, Ada, Okla., Oct. 22; Annual Convention, Mayo Hotel, Tulsa, Okla., March 24-25, 1955.

Public Information Program
Workshop Conference, Chase Park Plaza Hotel, St. Louis, Oct. 28-29.

***National Electrical Manufacturers Association**
Annual Meeting, Haddon Hall Hotel, Atlantic City, N. J., Nov. 8-11; Winter Meeting, March 7-11, 1955.

***National Association of Railroad and Utilities Commissioners**
Annual Convention, La Salle Hotel, Chicago, Ill., Nov. 8-12.

American Standards Association
36th Annual Meeting and 5th National Conference on Standards, Hotel Roosevelt, New York, Nov. 15-17.

***21st National Power Show**
Sponsored by American Society of Mechanical Engineers, Commercial Museum, Philadelphia, Dec. 2-7.

***Eastern Joint Computer Conference-Exhibition**
Bellevue-Strafford Hotel, Philadelphia, Dec. 8-10.

***National Association of Purchasing Agents**
24th Annual Mid-Winter Conference, Public Utility Buyers' Group, Shamrock Hotel, Houston, Tex., Feb. 13-15, 1955.

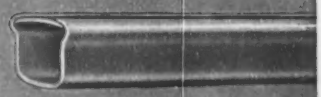
***Southern Safety Conference & Exposition**
Jung Hotel, New Orleans, La., Feb. 27-Mar. 1, 1955.

*Additions this week.

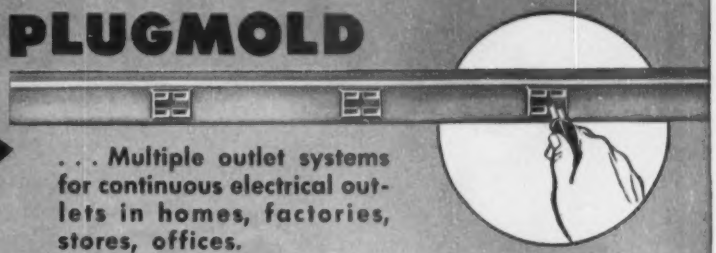
Wiremold's big 4 build better business for you ...at a profit!

WIREMOLD One-Piece Surface Raceways

. . . safest, surest way to carry electrical power anywhere—right on the surface!



PLUGMOLD



. . . Multiple outlet systems for continuous electrical outlets in homes, factories, stores, offices.

Four sizes with capacities up to 10 No. 6 conductors.

PANCAKE Overfloor Raceways

. . . safest, easiest way to carry power or communication lines overfloor to the point of use.

WIREMOLD Fluorescent Units

. . . for cove, cornice, or valance lighting; for all types of supplementary lighting, such as display cases, shelves, etc.

ALL OVER THE COUNTRY, progressive electrical contractors are using **Wiremold's BIG 4** *— best way to wire most buildings and the only way to wire many buildings. Write today for full information — see how the* **BIG 4** *will build better business for YOU!*

The WIREMOLD Company
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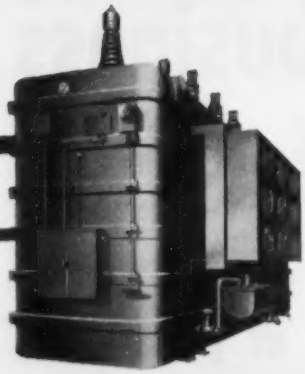
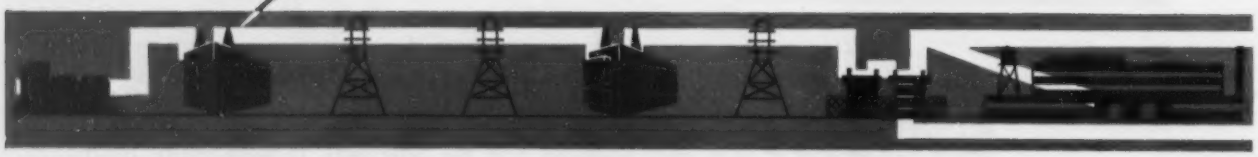
MOLONEY..



Moloney Power Transformers, engineered and built to your specifications, are available in any Kva and voltage rating for utility and industrial applications.

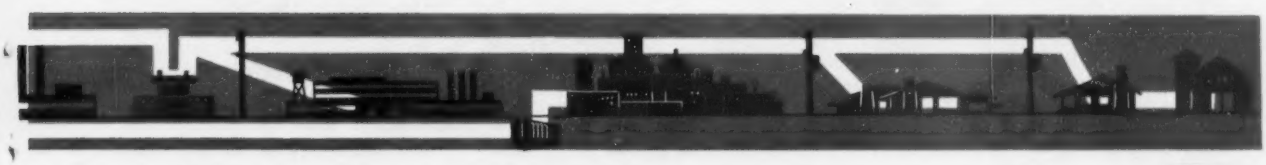


SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES

For years the name Moloney on a transformer has meant a better product. As utilities have grown and become more complex, so have transformers. All this expansion in the power field has been paralleled by expansion here at Moloney. Many utilities feel that Moloney Transformers are the best you can buy. They are right, because—

. . ALL ALONG THE LINE!

Take, for instance, Power Transformers; Today utilities demand transformers in higher Kva and voltage ratings. Yet, while Kva and voltage ratings are greater, and still growing, certain factors such as size are still limited. To keep pace with utility demands, Moloney expanded its facilities and developed new and improved designs to fit today's *and* future needs. Transportation limitations have influenced transformer design. To overcome these limitations, Moloney Engineers adopted shielded concentric layer type high voltage coils. Concentric layer high voltage windings possess both high mechanical strength and high impulse strength. With this type winding it is now possible to produce transformers of today's or tomorrow's ratings, within space limitations of present transportation systems. MEG4-14

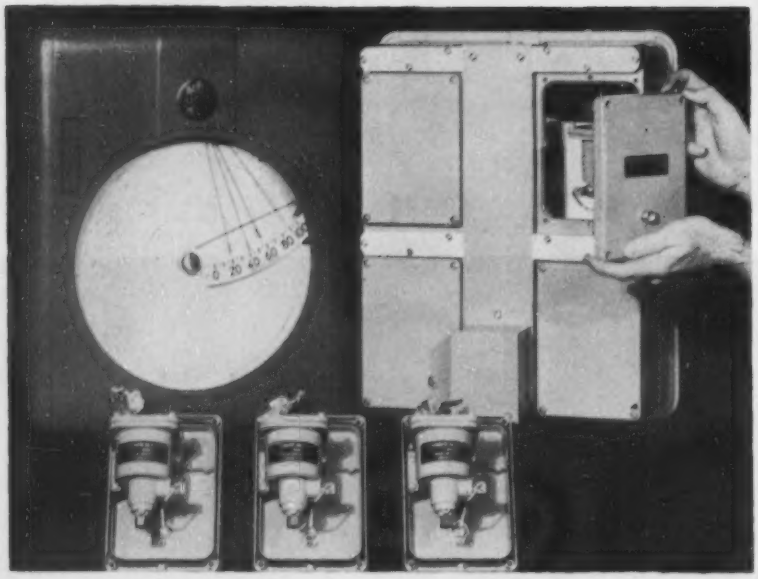


MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

NEW EQUIPMENT



Electric-Pneumatic Recorder With Plug-In Receivers

Receiver-recorder for power and process plants keeps continuous, independent records of one to four electric or pneumatic transmissions in any combination. Unique, plug-in, precalibrated receiver units may be added or interchanged, permitting field adaptation to new or revised metering and control applications. Two plug-in escapement-type integrators may be included in same casing with two flow records.

Fountain-type recording pens provide continuous feed for one year without refilling. The pens are stainless steel capillary, fed from hermetically-sealed ink sacs. Available finishes are green, buff, grey, or black baked enamel. Panel cutout required is 14 x 17 in. Operating models will be shown at the First International Instrument Exposition, Philadelphia, Sept. 15-21. Product specifications are available on request.

Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland, Ohio

250-w Mercury Lamp

Color-corrected 250-w mercury-vapor lamp is designed for mounting at heights under 20 ft. This lamp, the CC-H5, is claimed the first of its type and of medium wattage available in this country.

Suggested uses include street, bridge, and park lighting and for "tapering-off" zones outside of brightly lighted city streets. Color correction is achieved by a special phosphor coated on the interior of the outer globe.

Additional characteristics are:

• Lumens	10,000
• Lumens per watt	40
• Rated life (hr)	6,000
• Bulb size	BT-28
• Arc Tube	Quartz
• Base	Mogul Screw
• Burning position	Any
• Over-all length (in.)	8 5/16
• Voltage, open circuit	250
• Voltage, operating	135
• Current, starting (amp)	2.9
• Current, operating (amp)	2.1
• Starting time (min)	4-8
• Restarting time (min)	4-8

Sylvania Electric Products, Inc, 1740 Broadway, New York 19, N. Y.

Hot-Line Demand Meter

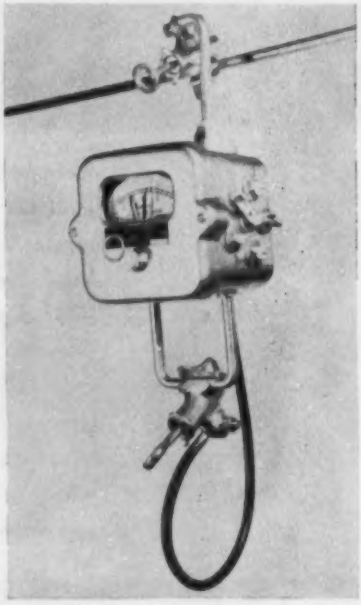
Hot-line maximum demand ammeter (thermal), the Ind-I-Max, can be used on high-voltage lines where most connections are made with hot-line clamps.

The instrument can obtain peak current measurement without interruption of load current.

The current transformer has five ratios, permitting current measurement from 0 to 30 amp (Model R30) and 30 to 60 amp (Model R60). The meter has a 5 amp nominal, 6 amp maximum rating.

Two hot-line clamps are bronze-plated, all-purpose type. Maximum conductor sizes are: 2/0 ACSR plus armor, 336,400 cm ACSR, or 400,000 cm all-aluminum or copper. Minimum sizes are: 6 ACSR or 6 solid aluminum or copper.

Ind-I-Max measures demand by measuring the heating effect of the load. The thermal element requires



about 30 min to register 98% of the load. Full load is registered in about 45 min.

The Ind-I-Max (ammeter, indicating thermal) has received REA one-year trial acceptance. Accuracy is guaranteed to 2%. The instrument weighs 9½ lb. Details are given in Bulletin 11M 54.

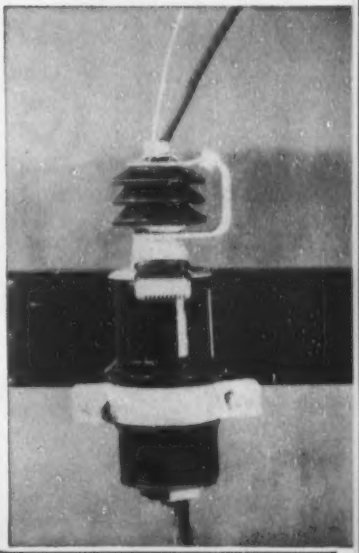
HD Electric Co, 760 Osterman Ave, Deerfield, Ill.

Hubbard Autogaps

make the big difference...

CONVENTIONAL ARRESTER

HUBBARD AUTOGAP

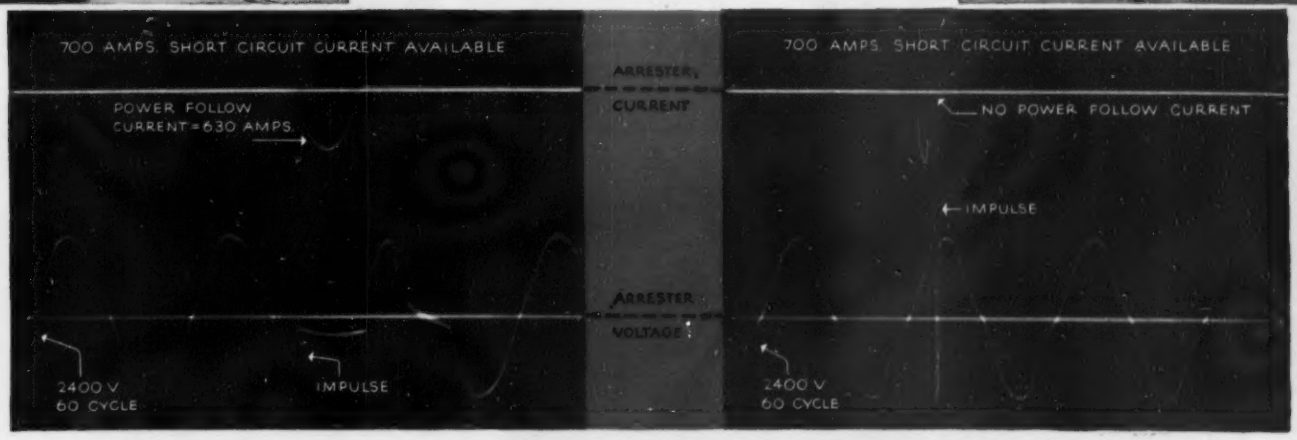


The AUTOGAP is the one lightning arrester available for *all* system conditions. In the twin vented Autogap a unique fibre barrier plug develops adequate deionizing gas pressures from the lightning current, while all other expulsion arresters normally require the additional action of power follow current for equivalent pressures.

The Autogap Arrester has a lightning capacity of 150% of the standard minimum requirements and has a negligible discharge voltage for any lightning current. It is therefore suitable for systems with the most extreme lightning exposure.

Each rating has an impulse sparkover characteristic that provides approximately a 50% safety factor for the new equipment insulation. It is therefore recommended for the protection of all equipment, old or new.

Both arresters illustrated were photographed while under identical test conditions. The "conventional" arrester temporarily shorted the system while the Autogap conducted lightning only.



CONVENTIONAL ARRESTER . . . Above oscillogram and photograph were recorded during a duty cycle test of a 3 KV "conventional" arrester. The large volume of expulsion gases, blowing out the bottom and representing consumed fibre, is a result of the 630 amps. of arrester power follow current. The test shows typical "conventional" arrester duty cycle operation.

HUBBARD AUTOGAP . . . Above oscillogram and photograph were recorded during a duty cycle test of a 3 KV Autogap arrester. Note that the arrester conducted the surge current only, hence the conspicuous absence of expulsion gases. The test shows typical Autogap duty cycle operation.

Proven: Autogap superiority has been demonstrated in impartial field tests conducted by utility companies; in exhaustive laboratory tests; in over 14 years success-performance record from coast to coast.

- Highest lightning capacity for intense or long duration surges.
- Lowest discharge voltage. *Exclusive twin vent.*
- The only arrester, valve or expulsion, that prevents power follow current.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

INET
Regulated
BATTERY
CHARGERS
A complete
BATTERY CHARGING
SUB-STATION
IN 1 UNIT
1954
POWER COMPANY TESTED
AUTOMATIC — OPERATES UNATTENDED
STATIC COMPONENTS
MAINTENANCE REQUIRED
Time-tested through years of power company use, the INET Regulated Rectifier Battery Charger is a centralized unit for the automatic charging of unattended batteries. Complete assembly including controls, meters, rectifiers and distribution load centers, are mounted in one complete unit for convenience and low cost installation.
INET

Distribution Posts

Distribution posts are rated 20 kv (No. 4320) and 27 kv (No. 4327). These are solid vacuum-process porcelain posts cemented into galvanized steel bases which take standard line post studs. Appearance is the same as higher voltage insulators.

Posts are claimed to be puncture-proof, free from radio and TV interference, rated 1,500 lb, and rugged against power arcover and mechanical abuse. They may be horizontally bolted directly to the pole with long studs. A pole-top bracket (No. 48707) is designed for these units.

Lapp Insulator Co, Inc, LeRoy, N. Y.

Large Motors

Line of large end-shield bearing synchronous and wound-rotor induction motors of four or more poles has been redesigned. The redesigned motors (Types AB and ANY) utilize the same bearing and cast end-shield construction as in the large squirrel-cage induction motor line.

Motors have greater mechanical protection, modern appearance, and increased accessibility to mechanical and electrical parts. The fabricated-steel stator yoke has been lengthened to accommodate slip rings and brush rigging with access openings for brush inspection and maintenance.

Overhung exciter mounting on synchronous machines uses split bracket secured to motor end shield. Upper halves of bracket and end shield can be removed for access to motor windings without disturbing the exciter or capsule bearing housing.

Construction is inherently drip-

proof and is available in splash-proof enclosure. End-shield bearing construction is standard for ratings up to about 1 hp per rpm for most applications.

Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.

Coming New Equipment

Received Too Late For This Issue

Power Fuses

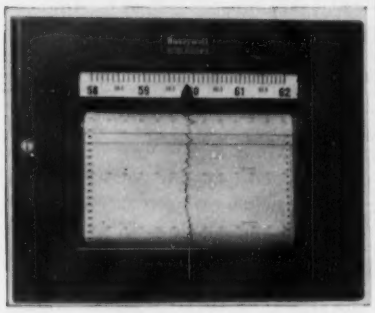
USCO Power Equipment Co— Has tube to protect fuse elements from corona damage

Grounding Clamp

Burndy Engineering Co—Has slot and bolt movement for different H-beam post widths

Arrester—Cutout Unit

Line Material Co—Provides protection for rural transformers, ratings up to 15 kv



Frequency Recorder

Electronic frequency recorder for power generating plants has a claimed faster response, increased accuracy, and extension of linearity over a wider range. The instrument uses a pulse-type frequency circuit with null-balance, position-type servo.

The single-record instrument continuously measures and records and indicates such changes as caused by variations in load on generating systems. These are, in turn, utilized to regulate power generation.

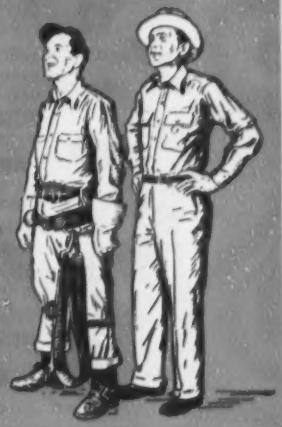
Accuracy is 0.01 cps. Instrument will respond to frequency changes as small as 0.005 cps. The electronic recorder is unaffected by changes in ambient temperature or wave form. It is available with 12 and 24 second full-scale pen travel. Standard ranges available are 48-52, 55-65, 58-62, and 59-61 cps. Chart is 12-in. wide with

Linemen call this hoist a "HONEY"

Designed especially for line work, this NEW CHANCE HOIST has all the features linemen want!

Here's what makes this ONE-TON HOIST the linemen's favorite:

- Well-balanced, easy-to-grip handle that operates from either side to avoid obstructions.
- "Free-wheeling" for ease in hooking to load, with an automatic locking control to prevent accidental dropping of load.
- Both half link and full link take-up for accuracy and speed.
- Easy working swivel hooks on both the chain and the hoist housing. Safety latch hooks, if desired, at slight additional cost.
- All working joints fitted with permanently lubricated oilite bearings.
- All working parts fully enclosed in the housing to prevent injury to fingers.



Here's the tool your linemen asked for in a nationwide field survey—a tool developed by Chance engineers, who *know* line work. It has all the good features linemen said they wanted in a hoist. It's a strong, fast-operating, lightweight tool (12 pounds) with a flexible steel load chain that won't kink, bind or uncouple. Controls can be worked without removing gloves. It's rated to lift a one-ton load and it's tested to 3000 pounds. Give your lineman the extra help and safety that the Chance Hoist can provide.

CT54-9

A·B·CHANCE CO·

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES

The Old Reliable!

for greater strength

RUGGED
DURABLE
DEPENDABLE

Porcelain Products wireholders and secondary service materials are built to pace-setting standards that *mean* reliability!

STRONG, STURDY CONSTRUCTION—for customer satisfaction.

METAL in TENSION—PORCELAIN in COMPRESSION—a feature so many contractors like.

HOT-DIP GALVANIZED steel parts, including the screw, for durability.

EXTRA SHARP SCREW THREAD—LUBRICATED reduces torque required to turn screw, makes fast, easy driving.

SCREW-SHANK HEAVIEST at base for maximum strength where load is most critical.

LARGER, PULLEY-ACTION WIRE HOLE—for easy installation of large wire sizes and to eliminate damage to insulation.

SCREW LENGTHS—2¼ inch and 3 inch standard stock items.

QUALITY—the name PORCELAIN PRODUCTS today, as for generations, is a by-word for quality, dependability and fair dealing.

See your distributor for complete details.

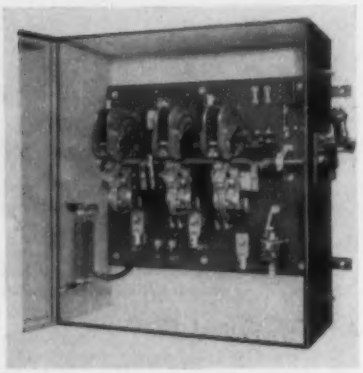
ELECTRICAL PORCELAIN SINCE 1894

60 years **Porcelain Products, Inc.** PP INC

FINDLAY, OHIO

10.5-in. calibrated width, and 120-ft long. Input is 65 va, 110-125 v. Ask for Data Sheet 9.1-8A.

Minneapolis-Honeywell Regulator Co, Wayne & Windrim Ave, Philadelphia 44, Pa.



Magnet Switch

For electric overhead cranes equipped with a lifting magnet, a combination crane and magnet disconnect switch de-energizes both magnet and motors in one operation. The switches are built in three sizes to cover the range of total horsepower ratings of cranes with lifting magnets.

With this Cat. DL 3000-A combination switch which has one-unit operation, an overload in the motor-feed will not drop the load on the magnet, and the operator can open the disconnect to cut-off all power on the crane.

Electric Controller & Mfg Co, 2700 East 79th St, Cleveland 4, Ohio

Vibration Analyzer

Portable combination instrument measures amplitude and frequency of steady-state vibrations for the degree and frequency of out-of-balance conditions in rotating or moving mechanisms. The instrument is provided with six amplitude ranges, two frequency ranges, a relative phase angle indicator for synchronous analysis, two pick-up connections, a variable frequency oscillator for tachometer application, a strobotron flash, front panel terminals for connecting oscilloscope, and fused protection.

The unit is furnished with the following accessories as desired: wooden

carrying case with storage holds, a strobtron, two pick-ups, either hand-held probe or mountable flat base types, frequency meter calibrated in either cycles per second or revolutions per minute, and any reasonable length cables. Total weight is 38 lb.
Technical Instrument Co, 3732 Westheimer Road, Houston, Texas

Control Center

Control center is designed for flexibility. Removable operator's panel in the door of each combination plug-in unit accommodates up to four push-buttons, selector switches, or pilot lights. This construction facilitates the removal of control center units since no wires to pilot devices in the door need be disconnected. When field changes become necessary additional pilot devices may be installed in the removable panel.

The plug-in control center units are enclosed on all sides. Unit doors attached to main structure can be reclosed after the unit is removed. Standard control center sections are 20 x 20 x 90 in. Each section will accommodate up to six plug-in units. Request Manual SM244.
Square D Co, 4041 North Richards St, Milwaukee 12, Wis.

Vibration Meter

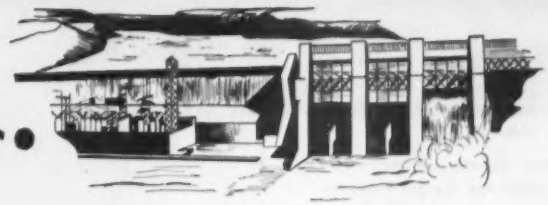
Direct-reading portable vibration meter reads both displacement and acceleration. This Type VHA meter measures over a 10-250 cps frequency range; 0-0.03, 0.1, 0.3, 1, 3, and 10

It's new!

IT'S BETTER . . . IT'S MADE BY

CONTROL CORPORATION

TM-15
TELEMETERING SYSTEM



BEST BY A DAM SITE—or anywhere you want to measure megawatts, RVA, water levels, gage readings—the TM-15!

FAST—TM-15 flashes 300 readings a minute to the receiving unit

ACCURATE—TM-15 based on precise time-ratio principle

RELIABLE—*unaffected* by voltage fluctuations

FLEXIBLE—TM-15 readings can be transmitted by microwave, radio, AC, DC

SELF-CONTAINED—no accessories needed with the compact TM-15

SIMPLE—TM-15 easily serviced by non-technical personnel

LOW INITIAL COST—LOW MAINTENANCE COSTS—the rugged TM-15 uses no expensive tubes, no fragile components, no complex wiring

The new TESTED TM-15 gives nearly instantaneous measurements for every phase of electric-power generating needs.

For complete information on how the NEW TM-15 can spark the job for you write or wire Control Corporation, 718 Central Avenue, Minneapolis 14.

CONTROL CORPORATION
723 CENTRAL AVE. N. E. • MINNEAPOLIS 14, MINN.
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

You can be sure it's

DEPENDABLE

It's a

Richardson Allen

A New Automatic Charger For Floating Service

- Full-wave charger, self-regulating, reactor controlled,
- Maintains correct voltage within ±1% under any charger load condition,
- Compensates for an A-C variation of ±5%,
- Sharp overload voltage drop,
- Dependable SELENIUM CELLS,
- No vacuum tubes,
- High-gain magnetic amplifiers,
- Many sizes available; special designs to order.

Write for descriptive circular

RICHARDSON-ALLEN CORPORATION

a manufacturing affiliate of

Wesley Block & Co., Inc.

39-15 Main St., Flushing, N. Y.

In Canada: Richardson-Allen of Canada, Ltd., 370 Victoria St., Toronto, Ont.

G acceleration ranges; and 0-3, 10, 30, 100, and 300 mils fullscale displacement ranges.

Meter consists of barium-titanate accelerometer, an electronic amplifier, and a copper-oxide rectifier feeding an indicating microammeter. Instrument is not affected by magnetic fields. Weighing 5 lb, it uses hearing-aid type batteries and measures 4 x 8 x 13¾ in. overall.

General Electric Co, 1 River Rd, Schenectady 5, N. Y.

Power Outlet

Rowan Type 620-A3GX oil-immersed power outlet has a manually operated, mechanically interlocked switch handle and plug. The arrangement prevents the insertion or removal of the plug while the switch is in the "on" position. This feature prevents the occurance of an accidental shut-off of circuit power. The power source must be opened by throwing the safety switch before the plug can be removed.

Plug and receptacle unit is Crouse-Hinds Type AR Arktite in 30, 60 and 100-amp sizes. The outlet is designed for connecting portable equipment.

Crouse-Hinds Co, Wolf and 7th North St, Syracuse, N. Y.

Shielded Enclosure

Shielded enclosure uses 24-gauge galvanized-iron sheet panels for better performance at lower frequencies. The enclosure, with its single shielding layer, has an insertion loss to electric field of at least 110 db from 14 kc to 1,000 Mc. Above 1 Mc the insertion loss to magnetic field is equal to the loss to electric field. Insertion loss to magnetic field at 150 kc is 102 db and decreases at lower frequencies to 9 db at 60 cps.

Ace Engineering & Machine Co, 3644 N. Lawrence St, Philadelphia 40, Pa.

3-Phase Transformer

Three-phase transformer, designated Tri-Wound, is made in sizes 9 through 75 kva and standard primary voltage ratings through 13,800 v in the delta-delta, delta-wye, or wye-delta connections.

The Tri-Wound design incorporates a wound core common to all three coils. It offers substantial reduction in weight and height over the existing Triplex line which it supplements. Features of the single-phase Round-Wound are retained in the Tri-Wound, including uniformly high impulse level, low exciting current, high short-circuit strength, and good overload capacity.

Line Material Co, 700 W. Michigan St, Milwaukee 1, Wis.

Tool Bags

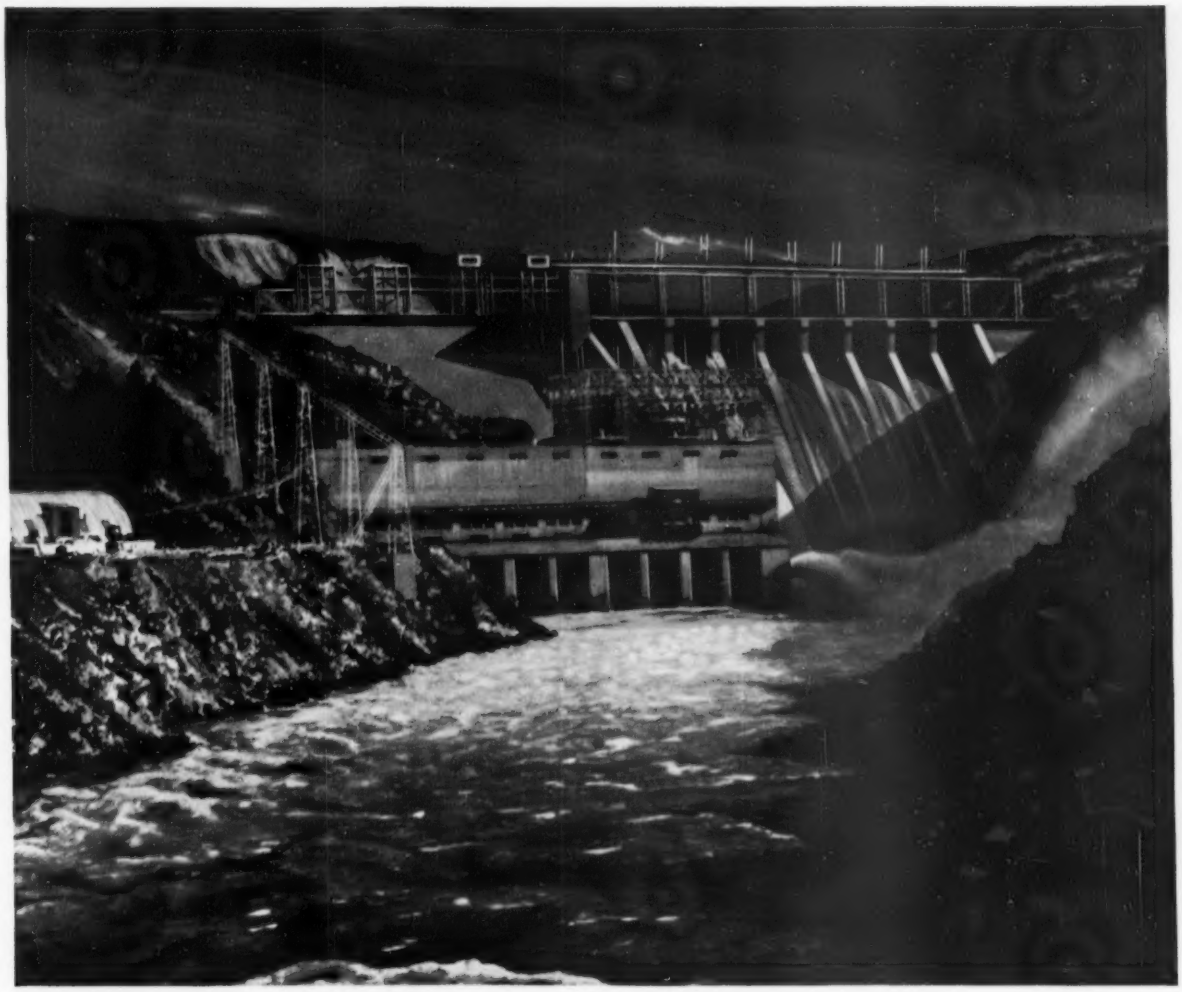
Line of tool bags for transmission line work have vulcanized-fibre collar at top to hold mouth of bag open. Sides are heavy weight duck. Bottom is waterproofed grain leather and handle is manila rope. There are no metal parts to come in contact with electric current.

Industrial Products Co, Philadelphia 33, Pa.

DC Power Plant

Small engine-driven generator is designed to mount on cab of truck and to operate a two-way radio and a cab heater. The Stateline model delivers

(*Continued on page* 155)



Waneta's gravity type dam has a length on top of 950 feet and provides a head of 210 feet. The spillway allows for a maximum flow of 280,000 cubic feet per second.

WANETA *on the* PEND d'OREILLE

For The Consolidated Mining and Smelting Company, Trail, British Columbia, Stone & Webster Canada Limited, in collaboration with Stone & Webster Engineering Corporation designed and constructed the Waneta Hydroelectric Development.

Waneta, located on the Pend d'Oreille River just above its confluence with the Columbia, is designed for an ultimate capacity of 480,000 hp.

The first two units, of 120,000 hp. each, are already on the line.

Write or call us for detailed information as to how our engineering, design, construction, report and appraisal services may be of assistance to you.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

New York Boston Chicago Pittsburgh Houston San Francisco Los Angeles Toronto

How DUKE POWER COMPANY moves the *REALLY BIG* loads

Two WHITE tandems move 300,000 lb. transformers

(A) LOADING UP this bulky load is a mean job. Here the transformer is moved onto the low-boys pulled by two husky White Model WC2864's, ready to go!

(B) ON ITS WAY, the huge transformer moves by White Mustang Power to the station ½ mile away. Plenty of Mustang Power here!

(C) MISSION COMPLETED, the rugged Whites stop at the end of the trip, turn the 300,000 lb. transformer over to the riggers.

PROBLEM: To move two 300,000 lb. transformers to a new station of the Duke Power Co., Spartanburg, S. C., not accessible by surfaced road or spur track.

SOLUTION: Two White Model WC2864 Tractors with low-boy trailers handled these big loads without delay or difficulty. Operating side-by-side, from siding to plant site, these rugged Whites had plenty of power . . . dependable all the way.

ELECTRIC POWER INDUSTRY EXECUTIVES ATTENTION!

This big hauling job is typical of the *many* ways White Trucks are modernizing transportation services in the electric power industry.

Your White Representative has all the facts about new ways to save . . . new efficiency . . . with White Specialized Design. Call him without delay.

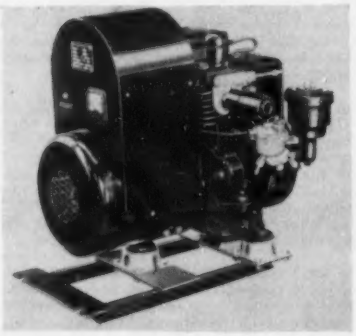
THE WHITE MOTOR COMPANY
Cleveland 1, Ohio

White

FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS

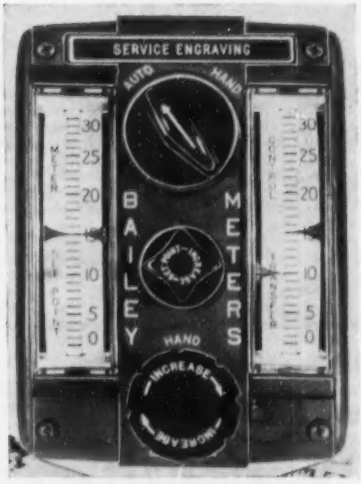
New Equipment

(*Continued from page* 152)



approximately 500 w dc and may be had for either 6 or 12 v. Equipment includes: Remote control stater, automatic voltage regulator, muffler, base, resilient mounts, automatic chocks, radio shielding, ammeter, oil bath cleaner, high-tension flywheel magneto and fuel tank with filter.

Howard Industries, Inc, Racine, Wisconsin



Pneumatic Control Station

Single control station for pneumatic control systems gives operating indication and control. The Mini-Line control station provides a picture of control system performance and full flexibility of remote control.

Vertical gages indicate signals from the transmitter, set point or bias, hand control, and automatic control. The three control knobs are for automatic-hand selection, set point or bias adjustment, and hand control.

Unit operates on standard SAMA signal ranges of 3-15 or 3-27 psig. Control desk flush mounting uses an area 6¼ x 4½ in. Gage accuracy is ±0.5% of signal range. Air consumption is less than 0.2 cfm. Details in Product Specification P99-1.

Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio

MORE NEW PRODUCTS
about which you should know

Instrument Motors, Box 5, Stamford, Conn., has Comspec permanent-magnet dc **tachometer** generators, 50-5,000 rpm, Models M-22 and M-24 rated 1 v per 100 rpm, and Model L-24 rated 3 v per 100 rpm.

Bucyrus-Erie Co, South Milwaukee, Wis., has a shorter utilities **dipper** for their all-hydraulic dragshovel (Hydrohoe). Cutting width is 26 in. It can dig a hole 5-ft deep and only 36-in. long, reducing interruption to traffic and cost of backfilling and street repair.

Microloc, 5811 Marilyn Ave, Culver City, Calif., has **impulse generator,** Series B7000, that converts mechanical energy into pulses of electrical energy, 5½ w for 25 milliseconds, measures 5½ x 2 x 3¾ in., weighs 2 lb 12 oz.

Caterpillar Tractor Co, Peoria, Ill., has new ratings for **engine-electric sets:** D326 is rated 1,800 rpm continuous, 118 bhp, 85 kw. D337 is rated 1800 rpm continuous, 162 bhp, 110 kw. Ratings for 12-hr service are: D326, 134 bhp, 95 kw; D337, 182 bhp, 124 kw. Above rates are for external regulation; kw output is about 7% less for internal regulation.

The Bristol Co, Waterbury 20, Conn., has Dynamaster **Btu recorder** for rate-of-heat input or output. Information input is the temperature difference and flow-rate. Flow-rate, temperature difference, and totalized heat transfer may also be recorded.

Automatic Temperature Control Co, Inc, 5200 Pulaski Ave, Philadelphia 44, Pa. have ATC **interrupters** with molded nylon timing cams and contact arms to reduce noise, wear, and friction; contacts rated to 4.6 kw (Bulletin J-31).

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

...THOMPSON *Servisafe*

POLE UNITS PROVIDE OUTSTANDING *ECONOMY . . . SAFETY . . . BEAUTY*

Efficient, safe, ground-level maintenance for street and parkway luminaires is guaranteed with Thompson "Servisafe" pole units. Single and double-arm models are available for use with all standard pendant type lighting fixtures.

Featuring a patented disconnecting and lowering mechanism, these easy-to-operate assemblies completely eliminate pole climbing. There are no electrical hazards for maintenance men because the lowered luminaire is "dead".

In addition, the new Thompson "Servisafe" pole units permit greater luminaire mounting heights, long recognized as necessary for improved area illumination but restricted to date by the available types of servicing equipment.

A variety of new, tapered steel and aluminum poles can be supplied to meet every application.

Write for Catalog PB-53 for complete details.

1006-TE

THE THOMPSON ELECTRIC CO.

1114 POWER AVENUE • CLEVELAND 14, OHIO

CATALOGS • BULLETINS

● **AUDIO GENERATOR:** The General Radio Experimenter for June, 1954 covers new Type 1304-B beat-frequency audio generator, 20-40,000 cps, 1 w into 600 ohm load. General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass.

● **REGULATOR:** A 2-page bulletin (K-2076) describes Reliance VSR electronic regulator for speed, voltage, and current regulation for industrial electric motor drives; it controls motor or generator field excitation in repsonse to input signal from the quantity being regulated. Reliance Electric and Engineering Co, 1076 Ivanhoe Rd. Cleveland 10, Ohio

● **FREQUENCY RECORDER:** Data Sheet 9.1-8a describes the Electronik Frequency Recorder using pulse-type measuring circuit. Accuracy is ±0.01 cps, sensitivity is 0.005 cps, for 50 or 60 cps systems. Minneapolis-Honeywell Regulator Co, Wayne & Windrim Ave, Philadelphia 44, Pa.

● **DYNAMOMETERS:** A 12-page bulletin (GEA-5923A) describes use of dc dynamometer systems for testing internal combustion engines, transmissions, torque converters, pumps, electric motors, compressors, etc. General Electric Co, One River Road, Schenectady 5, N. Y.

● **CONDENSERS** A 24-page bulletin (19B7987) covers steam condensers and how they are made. Bulletin covers 100-125,000 sq ft condensers, backwash systems for single and two-pass units to keep them debris-free, and air removal equipment. Allis-Chalmers Manufacturing Co, 932 S. 70th St, Milwaukee, Wis.

● **CONTROL VALVES:** Bulletin 101B, 12 pages, covers air control valves. Ross Operating Valve Co, 120 E. Golden Gate Ave, Detroit 3, Mich.

● **VALVE ACTUATORS:** An 8-page bulletin (3020) covers plug valve actuators, tandem type for valves requiring high torque, floating bar type for low torque. Bulletin includes actuator selection table, applications, dimension, weights, and mountings. Ledeen Manufacturing Co, 1600 S. San Pedro St, Los Angeles 15, Calif.

● **PIPING:** A 32-page bulletin, Piping for Permanence, illustrates use of wrought iron in piping systems to help solve corrosion problems. A chapter covers water analysis and treatment. Engineering Service Dept, A. M. Byers Co, 1501 Clark Bldg, Pittsburg, Pa.

● **FLOODLIGHTS:** Bulletin 128-54, 4 pages, covers general purpose floodlights, 200-300 w, aluminum. Steber Manufacturing Co, Broadview, Ill.

● **FLUORESCENT LUMINAIRE:** A 1-page bulletin (470A) covers the Arealux Series 164, shallow, wide-area fluorescent luminaire for classrooms, libraries, stores, and offices; 35 3/5 wide by 5 in. deep and 4, 6, or 8 ft. long. Lighting Products, Inc, Highland Park, Ill.

● **SILICONES:** An 8-page booklet, Maximum Performance thru Vacuum Impregnation with Silicones, announces the company's installation of equipment for vacuum impregnation with silicones insulation. Marine Electric Corp, 600 Fourth Ave, Brooklyn 15, N. Y.

● **BERYLLIUM COPPER:** A 4-page bulletin (2) presents information on new type mill-hardened beryllium copper strip that requires no heat treatment. Penn Products, Inc, 501 Crescent Ave, Reading, Pa.

● **FEEDRAIL:** Bulletin 45, 36 pages, covers 60-amp trolley busway. Feedrail Corp, 125 Barclay St, New York 7, N. Y.

TECHNICAL LITERATURE

ANTI-CORROSION COATINGS—Bulletin 100, 4 pages, gives reference data charts on corrosion-resisting coatings—phenolics, furans, neoprenes, vinyls, rubber-base resins, and epoxies. Carboline Co, 331 Thornton Ave, St. Louis 19, Mo.

NEMA STANDARDS — Following are available from National Electrical Manufacturers Assn, 155 E. 44th St., New York 17, N. Y.:

EW2-1954 Arc-Welding Electrode Identification—16 pages. Price 70¢.

SG4-1954 Power Circuit Breakers—65 pages. Price $5.

VU 1-1954 Vulcanized Fibre—12 pages. Price 70¢.

MG1-1949, revised pages, 7th set. Motors and Generators—61 pages, dated Feb. 1, 1954.

WESTINGHOUSE BULLETINS—Following are available from Westinghouse Electric Corp, 200 Readville St, Hyde Park, Boston 36, Mass.:

Catalog 1620 Heating and Ventilating Units, 1,200-23,000 cfm, 100,000-2,500,000 Btuh—40 pages

Catalog 1630, Air Conditioning Units, 1,200,-21,000 cfm, 20,000-2,000,000 Btuh—40 pages

FILM: PRODUCTIVE MAINTENANCE—This 25-min color film was used at GE's Productive Maintenance Forums throughout the nation, and is now available for showings at trade and association meetings. As outlined, productive maintenance includes 5 steps which industry can follow to increase productivity of existing facilities: Gather complete equipment data, evaluate routine maintenance, establish a routine operating control system, evaluate critical maintenance, and establish a critical maintenance program. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

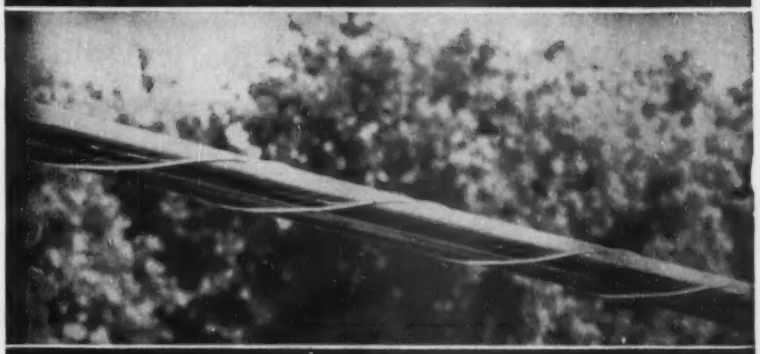
FILM: RESISTANCE WELDING OF STAINLESS STEELS—This 16 mm, 21-min color and sound film prepared by Allegheny Ludlum Steel Corp, is valuable to production people and designers, engineers and metallurgists, and training courses and classes in technology. It records, step by step, the complete resistance welding operation and covers types of equipment, proper handling of stainless steels, the different weld joints, and precautions to be observed. Resistance Welder Manufacturers' Assn, 1900 Arch St, Philadelphia 3, Pa.

WELDING ALUMINUM—Welding Alcoa Aluminum (176 pages) covers latest developments in the science of welding aluminum. Photos and drawings illustrate the text. Methods include torch welding, arc welding (including inert-gas shielded), resistance welding, and pressure welding. A chapter covers each method, followed by a section on performance of welds, quality control and safety, and a final section of 32 comprehensive tables of welding data. Aluminum Company of America, 733 Alcoa Bldg, Pittsburgh 19, Pa.

LOW-TEMPERATURE WELDING ALLOYS—Manual of Design and Welding Engineering, Low Temperature Welding Alloys (16 pages) covers welding with thin-flowing electrodes. Eutectic Welding Alloys Corp, 172 St & Northern Blvd, Flushing 58, N. Y.

TEXTILE FIBERS—A 20 page booklet, Textile Fibers, Basic Materials for Industry (A-7680) covers acetate, nylon, Orlon (acrylic fiber), Dacron (polyester fiber), Cordura (rayon, high tenacity), and Teflon fibers and their properties, uses, and availability. E. I. Du Pont De Nemours & Co, Inc, Wilmington 98, Del.

SPIN CABLE LIKE THIS...



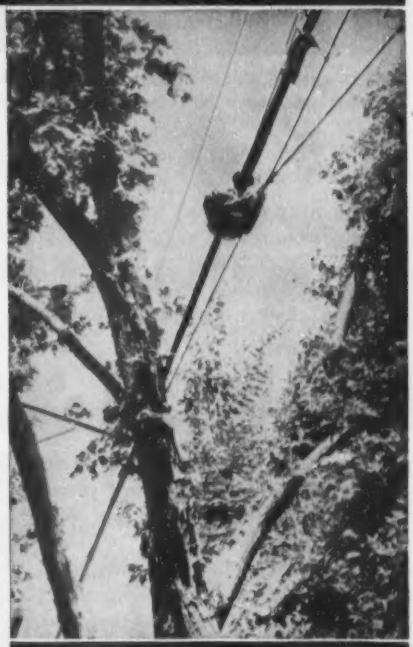
THROUGH TREE-CONGESTED AREAS AT MUCH LESS COST...

You can save man-hours of wood-cutting and customer complaints when you spin cable through tree-congested areas. What is more, spun cable costs much less to install than pre-assembled cable. Spun cable is so compact that it saves valuable space wherever congestion is a problem.

You save splices and installation labor, because light weight single conductor cables may be spun in lengths three times as long as pre-assembled cables.

You reduce your cable inventories, because 1/c, 2/c and 3/c cables can be spun in the field as required.

Add to these benefits the extra margin of protection against storm damage...and you readily understand why there is a marked trend to cable spinning in the power field.



with NEALE Model "K"

HOW IT WORKS

Drum rotates when its two friction drive wheels respond to pulling of wire. Drum revolves once when 13" of wire is pulled — regardless of condition of strand. Drum carries two spools of wire, each spirals 13" giving support every 6½". Magnesium castings used wherever possible for lightness and strength. Weight: only 36 lbs. Overall length: 18½".

THE WORLD IS SPINNING—TOO! PHONE 2-7224

Cable Spinning Equipment Co.

3100 TOPEKA AVE. TOPEKA, KANSAS

INDUSTRIAL APPLICATIONS

Electric Oven Speeds Automatic Mold Production

MOLD-MAKING MACHINE increases output of shell patterns 300% with half the man hours. Automatic machine mixes ingredients, forms molds and feeds them into electric baking oven

JOE W. PARRIS, Advertising Dept, Georgia Power Co, Atlanta, Ga.

Producing molds for making shells by a new automatic method (employing an electric oven) at the Massey Gin and Machine Works, Macon, Georgia, enables one operator to turn out 250 to 300 molds daily. The formerly-used conventional (green sand molding) method required two men (one molder and one helper) to produce only 75 to 100 molds a day

The shell pattern molding machine consists of two main units. First the pattern is formed in the box-like unit at right hand side of machine. This unit, containing a precise mixture of sand and resin, rotates on its axis, thoroughly mixing the two ingredients (a process that is done by hand, slowly and laboriously, in the conventional method).

Then the pattern is dropped by this forming and mixing unit into a track, where it is carried over to the other large unit of the machine—a 46½-kw electric oven. Just before the pattern reaches the oven, the door opens and the pattern enters. As soon as the pattern is well inside the oven, the door shuts.

When the pattern has baked to the proper point, the oven door opens, the pattern rolls again to the center of the track and is removed by hand. As soon as one pattern is finished, another is starting to form. This goes on automatically without let-up as long as the hopper contains the sand-resin mixture.

Dehumidifiers In Basement Save $4,000 Annually

Savings of more than $4,000 a year are being realized by Racine Hydraulics and Machinery Inc, Racine, Wisconsin, through the use of eight dehumidifiers in the basement storage area of this plant. This annual saving is more than four times as much as the original purchase price of the eight dehumidifiers.

The dehumidifiers prevent formation of rust on both finished products and parts awaiting assembly in the firm's 70,000-cu ft basement storage area by removing as much as 24 gal of water from this area every 24 hr. Connected load is about 1,500 w.

William Reinhardt, Jr., plant superintendent, said the use of the dehumidifiers has not only resulted in the saving of money, but also of time and inconvenience and in the improvement of working conditions. "With the dehumidifier units, we showed a reduction of relative humidity of about 20% after an actual check over a period of three months," he said.

"Without the units in 1952, we experienced heavy rust damage and this resulted in costly de-rusting operations and production slowdowns. During 1953 with the units in operation, no appreciable rust damage was experienced," he stated.

Westinghouse Electric Corp

PREVENTING RUST FORMATION on both finished products and parts awaiting assembly in 70,000-cu ft basement storage area by using electric dehumidifiers eliminates costly de-rusting

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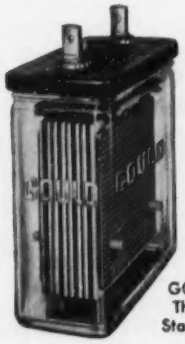

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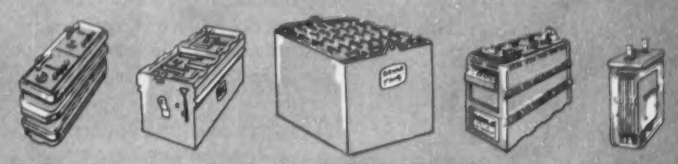

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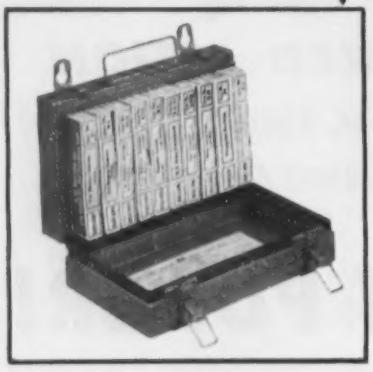

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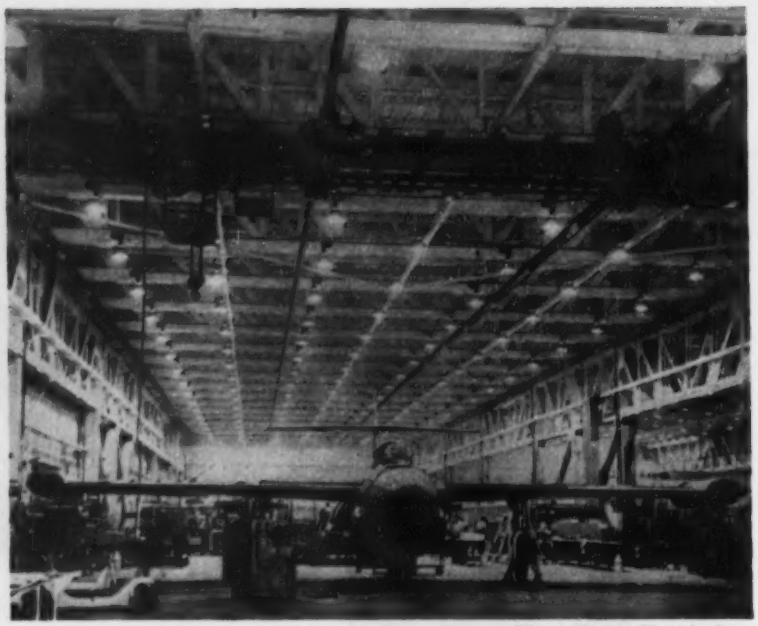

Westinghouse Electric Corp

RELIGHTING aircraft production line with 400-w, J-H1 fluorescent-mercury lamps in ventilated, high bay reflectors provides 35 ft-c of "golden white" light at high mercury efficiency.

Modernized Lighting Cuts Maintenance

A new fluorescent-mercury lighting installation, consisting of 274 400-w, J-H1 fluorescent-mercury lamps has replaced a 10 ft-c incandescent system at Northrup Aircraft's Plant 3, Hawthorne, Cal. Designed to provide 35 ft-c in service, installation uses ventilated high bay reflectors which cut down drastically on dust accumulation. Spaced on 20 by 12½-ft centers at 30-ft mounting height, the lamps provide a "golden white" light at high mercury efficiencies.

Electric Oven Cuts Sheet Warm-Up

Post-forming plastic sheets with electric oven has cut warm-up time 45 min and eliminated lost time due to burn-outs at Dayton Plastics, Inc, Dayton, Ohio. The acrylic sheets vary in size, largest being 3 ft. Sheets 1/16 in. thick are brought to working temperature in 2-3 min. The ½ in. sheets are ready for forming in approximately 30 min. Oven used previously required one hour for warm-up. The electric oven comes up to temperature in less than 15 min. It has 12 - 500-w finstrip units and is thermostatically controlled. A blower maintains uniform temperatures throughout. Since customer has installed finstrip heaters he has not experienced any burn-outs. Lost time due to a cold oven has been eliminated. E. W. Miller, Electric Heating Engineer, Dayton Power and Light Co.

Portable Heaters Solve Flood Problem

Electric space heating solves a flood problem in the office of Kosmos Portland Cement Co which is located on the banks of the Ohio River, in Cincinnati. No permanent space heating system can be installed because it would be subject to flood waters. Several portable 3000-w space heaters are used. They are flexible and portable. When flood waters threaten, heaters can be unplugged and easily moved to a higher level. Equipment has automatic temperature control and employees are happy with uniform temperature maintained and clean, odorless heat. These heating units are plugged into wall outlets and are controlled by a wall thermostat which can be set for any desired temperature. L. J. Langevin, Power Engineer, Cincinnati Gas & Electric Company.

INDUSTRIAL BRIEFS

Checking color samples of foundation garments against standard colors by use of Macbeth Examolites at Chavis Corp, Allentown, Pa., solved a color-matching problem. Previously, "off shade" colors were not noticed until a garment was finished. Company is well satisfied with installation and plans further installations of these units over the examining tables. Total load of units installed is 500 w. Paul Britt, Industrial Power Engineer, Pennsylvania Power & Light Co, Allentown, Pa.

Drying glue used in splicing plywood with cartridge heaters in metal shoes at the Georgia Pacific Plywood and Lumber Co, Savannah, Ga., has largely eliminated waste from defective veneer and produced a superior product. Splicing machines join narrow strips of veneer together edgewise. Glue is applied automatically to edges. The electrically heated shoes dry the glue as the two edges are pressed together. The sheets of pieced veneer are used as the inner plys of the finished plywood. Total heater load is 40 kw. C. D. Anderson, Industrial Power Engineer, Savannah Electric Power Co, Savannah, Ga.

Electric space heating of watchman's booth at Dolly Madison Cake Division, of Interstate Bakeries, Inc, Cincinnati, O., provides comfort for the watchman even in coldest weather. The 4 by 4-ft metal and glass booth is heated by a manually-controlled 2-kw unit. The use of electric heat for this installation was far easier and much more economical than any other form of heat available. T. V. Morrow, Power Engineer, Cincinnati Gas & Electric Co.

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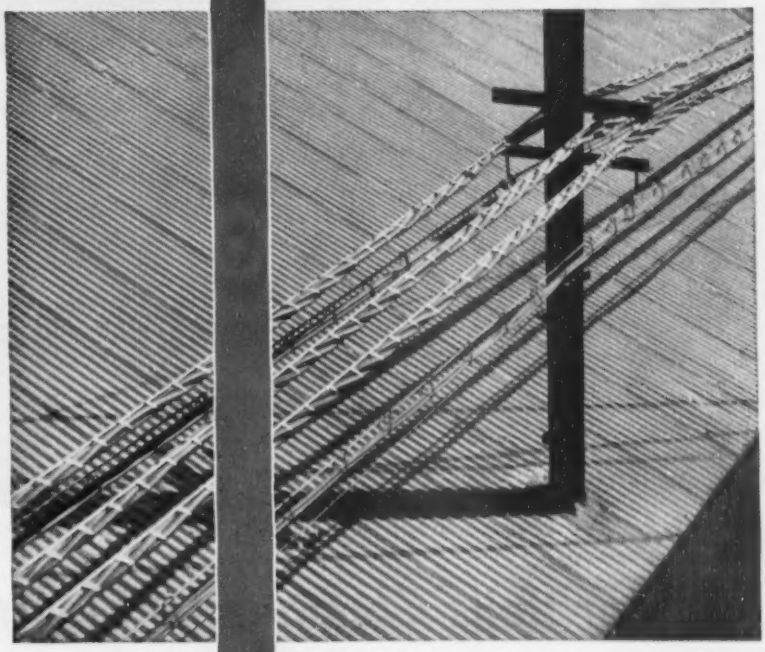
PAGE
Stainless Steel Strand



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• The photograph above shows just one example of how PAGE Stainless Steel Strand is ideal for applications involving rugged service conditions.

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PAGE Strand

TRAILER TOURED TERRITORY from April through October to bring the story of commercial electric cooking to busy restaurant operators

Trailer Sells Commercial Electric Cooking

S. S. SANSBURY, Manager, Development and Training Division, Union Electric Company of Missouri, St. Louis

In order to reach the busy restaurant operators, Union Electric Co of Missouri's commercial sales personnel toured the company's territory from April through October with a trailer demonstration of counter cooking appliances. The tour was not a hit-or-miss affair. It was carefully planned.

A district representative and a commercial cooking representative were always with the trailer. Sometimes they were accompanied by a field supervisor or a dealer salesman or both.

A schedule was set up with dealers making the trailer available to them for their use. Names, addresses and comments of those contacted were given to dealers for follow-ups.

The trailer tour covered all the outlying territory, moving in a tightening circle from the fringe area into St. Louis. Once in the metropolitan area it made systematic visits to restaurants. A total of 334 calls were made during the summer. Union Electric men did not close sales after the demonstrations. Leads were channelled through distributors to dealers.

Although it is difficult to measure it exactly, the value of the tour is indicated by the accompanying tabulation.

Results Secured by Commercial Cooking Trailer Activity

Month	Number of Trailer Demonstrations	Interest Shown Number	Interest Shown Percent	KW Load Added	Number of Appliances Added	Average KW Added Per Call	Average KW Added Per Appliance
April	84	57	67.9	120.275	40	1.43	3.01
May	53	31	58.5	58.285	18	1.10	3.23
June	41	28	68.3	100.270	56	2.45	1.79
July	30	20	66.7	66.840	31	2.15	2.13
August	32	19	59.4	60.690	21	1.89	2.89
September	49	35	71.4	116.890	32	2.39	3.65
October	45	21	46.7	38.350	19	.85	2.02
TOTALS	334	211	63.2	561.600	217	1.68	2.59

Load results include equipment purchased immediately following the trailer call and that purchased up to December, 1953. This later information was developed as a result of a call-back survey during December, on the 334 customers to whom the trailer had been taken during the previous spring, summer, and fall.

Con Ed's Adequate Wiring Movie Proves Popular

Con Edison has produced a 16mm sound color moving picture as the latest addition to its adequate wiring program. Since its preview on June 15, the movie has had 30 showings to 5,000 people through July 14, and 24 more showings were scheduled as of this date. It is designed to enable the utility to reach every segment of the population which should understand the undesirable effects of inadequate wiring. Entitled "The Magic Link" it runs for 19 min. It was produced entirely by professionals and is based on the formerly used live show which was very successful.

The film tells the story as a light domestic comedy, portraying the difficulties encountered by a young married couple in trying to live electrically in the face of inadequate wiring. It is an effective presentation for all types of audiences and is particularly suited for showing women's groups.

Booklet . . . Con Edison has also prepared a booklet, containing information on suggested remedies for adequate wiring, which is presented to each person viewing the film. The booklet contains a pencil, specially made, in which the pencil lead is the same diameter as a #14 conductor and the outside dimension of the wood of the pencil is the same as a #6 wire. The pencil has proved to be a very effective gimmick.

Survey . . . A survey conducted last year of 8500 private homes, representing about 1% of the total homes in Con Ed's territory, indicated that 78% lacked sufficient wiring to adequately supply the appliances they now have. 42% said that they intended to buy additional heavy duty appliances, whereas only 12% of the total homes had enough capacity to carry these appliances.

Last year more than 260,000 of Con Ed's customers asked the utility to replace blown fuses on customer-owned wiring. Landlords in apartment houses are prohibiting the installation of air conditioning by tenants because the apartment wiring cannot take the load. Many buildings being built today are inadequately wired for the normal loads that can be expected. In several new apartment projects, now under construction, the owners have stated that they intend to prohibit the use of air conditioning by tenants. Last year, 940,000 room coolers were sold in the territory. For the past six years, the number of room coolers sold in New York has doubled almost every year. There are about 500,000 broilers in the territory now, and they are being sold at the rate of 50 to 60 thousand a year. Other heavy duty appliances show similar rapid acceptance and are at low saturation.

Corrective Action . . . Con Edison feels that this situation demands corrective action and that its proper contribution is advisory and educational. To this end, Con Edison launched an Adequate Wiring Program at the beginning of last December and established an Adequate Wiring Bureau within the Sales Department.

Edison offers consultative advice on proper wiring to architects, engineers, builders, contractors, lending institutions and all other groups who should have up-to-date information on adequate wiring. This service is free and has been effective. Thus far the program has resulted in increasing the wiring capacity in over 65 apartment and office buildings by as much as 300%.

Stage Show . . . In the first educational phase of the Adequate Wiring Program a stage show, coordinated with a commentary, was developed. It was launched in the Waldorf-Astoria on December 1st and 2nd, and since then has been shown to an audience of approximately 7500, composed of architects, engineers, etc.

Con Edison is making the film available to the industry on one of three bases:

1. On temporary loan, considered generally not to exceed a week, at no cost.

2. On permanent loan involving no changes from the master negative, at a cost of $175 per print.

3. On permanent loan, but changing the opening and closing title frames substituting "presented by Con Edison" to the name of the individual utility company and eliminating the one reference to Con Edison in the dialogue of the picture itself. The cost of this is $700 for the first print and $200 for each additional print. The only credit to Con Edison is in the closing acknowledgement title frame "produced by George Blake Enterprises, Inc. for Con Edison Company of N. Y., Inc." The prices mentioned cover purely the cost of the prints.

For information concerning the film or the program, inquiries should be addressed to L. A. Scofield, vice president, Con Edison, 4 Irving Place, New York 3, N. Y.

DIFFICULTIES encountered by a young married couple trying to live electrically in spite of inadequate wiring are dramatized in Con Edison's sound color film "The Magic Link".

LETTERS TO THE EDITOR

Electrical Highways, too, Are Overcrowded

To the Editor:

In the July 26 issue of "News Week" appeared the following item:

PLAN AND PREJUDICE

"The United States is now an eight-cylinder nation with four-cylinder roads. There are no less than 55 million cars and trucks in the U. S. today, crammed into a road system built for 35 million. Every year, the cars and trucks keep getting bigger, heavier, and more powerful; yet, the U. S. will lay hardly a square foot more road surface in 1954 than it did in the '30's. It wasn't laying nearly enough then, and since the demand now is for four-lane highways, not two, a square foot of road today goes only half as far.

"Traffic accidents will kill 40,000 Americans this year and injure 1.35 million, and they will clog the courts with civil suits. Traffic jams will waste billions of manhours. The road system is strangling the nation, physically, and economically."

As I read it, I thought I would paraphrase it. Here is the paraphrase:

"The United States is now a 100-amp nation with 30-amp electrical highways. There are no less than 30 million homes today which are looking forward to electrical living which can't be accommodated on present entrances. Every year the requirements in the home for electrical use keep getting bigger, heavier, and more powerful, and yet, many homes being built today are making no more provision for this increased load than was the case in the '30's. The number of houses that were being wired as recently as 10 years ago for 3-wire, 100-amp service wasn't anywhere near enough to support the productive capacity of appliances available today.

"Fuses continue to blow—appliances operate at low efficiency—and voltages become inadequate to clear the traffic jam on the existing roads. In the electrical industry the electrical highways in homes are denying electrical living to millions of families and strangling the nation's electrical development physically and economically."

You can see it is almost a direct copy from "News Week," and the parallel is most striking.

J. R. Poteat
General Manager
Range & Water Heater Dept

General Electric Co
310 West Liberty Street
Louisville 2, Ky.

Keeping the Hot Water Customer Happy

To the Editor:

In the July 12 issue there was an editorial on hot water heating, "Give the Customer What He Wants." After reading this, it occurred to me that one solution to this problem would be to set up a controllable water heating rate similar to that set up for us in Norwich by Steve Leffler. We allow a discount of ¾ ¢ per kwhr on all kwhr over 190 per month. But the kwhr subject to this discount shall not exceed 8 kwhr per gal of storage capacity of the water heater tank, and a time-controlled apparatus must be installed to limit the hours of heating-element operation to such periods as may be specified from time to time.

This type of rate encourages the customer to install ample size water heaters because the larger the heater, the larger the discount. A larger heater also eliminates the danger of running out of hot water. In my own home, we have an 82-gal tank and have always had plenty of hot water for our electric dishwasher and Laundromat. We discourage the installation of heaters of less than 50 gal capacity.

Another advantage of this scheme is that we do not require a special meter for hot water heating. We have a time clock on the hot water circuit which cuts off the electricity to the heater during the peak hours from 9:30 to 11:30 AM and from 4 to 8 PM. As this clock is not reset at the beginning and end of the daylight saving time, these hours become 10:30 AM to 12:30 PM and 5 to 9 PM during the period of daylight saving time.

I can't agree that we should load up our distribution circuits with fast heating, small capacity electric hot water heaters without time controls.

Theodore Braaten
General Manager

Department of Public Utilities
34 Shetucket Street
Norwich, Conn.

'Adequate For What,' Ohio Man Asks

To the Editor:

I have just been reading "Electrical World Editorial Influenced Apartment Owner" on page 162 of the June 28 issue.

What is this rewiring job considered adequate for? Certainly only for lighting and small appliances! Doesn't anyone use electric ranges, water heaters, or clothes dryers in Baltimore?

We have been installing a minimum of 3 No. 6 wire and a 60-amp switch here for over 20 years. And now quite a few of our new houses are installing 100-amp entrance switches, even though they may not be required at the time of installation.

Harold Seitz
District Service Man

Ohio Power Co
117 East Main Street
Leipsic, Ohio

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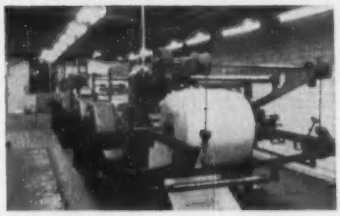

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Forsberg Elected President . . .

. . . of Wisconsin P&L to succeed Grover C. Neff, who remains as board chairman. Canfield, Kallevang, and Howard are advanced

CARL J. FORSBERG

New president of Wisconsin Power & Light Co is Carl J. Forsberg. Forsberg, formerly vice president in charge of operations, succeeds Grover C. Neff, who has retired after serving the company 46 years. Neff, head of the utility for the past 21 years, will continue as a member of the board of directors and serve as chairman.

2 New VP's . . . In other executive changes, John E. Canfield was elected vice president in charge of district operations and sales; E. J. Kallevang was elected vice president in charge of engineer, system operation and maintenance; and J. D. Howard was elected assistant to vice president in charge of engineering, system operation and maintenance.

Canfield has been vice president in charge of employee and public relations, Kallevang is chief engineer, and Howard has been assistant to vice president in charge of operations.

Started As Sales Engineer . . . Forsberg's utility career began in 1928 when he joined Public Service Co of Northern Illinois as a power sales engineer. Six years later he went to the Madison office of Wisconsin P&L. Later he served as industrial power engineer, commercial sales supervisor, district sales supervisor at Sheboygan and district manager at Lake Geneva.

He returned to Madison in 1947 as assistant to the vice president. He was elected vice president in charge of field operations in 1948 and vice president in charge of operations in 1953.

An employee of Wisconsin P&L since 1930, Canfield late in 1943 was made executive assistant and public information director a year later. He was named a vice president in 1951. Canfield is a past president of Public Utilities Advertising Association.

Kallevang, an electrical engineer, joined Southern Wisconsin Power Co, a predecessor company of WP&L, in 1915 as line superintendent, becoming chief engineer two years later.

Filled District Post . . . With Wisconsin P&L since 1934, Howard was acting district manager at Beloit before becoming in 1953 the assistant to the vice president in charge of operations, a post he filled until his present appointment.

Neff's retirement concludes a 46-year service record with Wisconsin P&L and predecessor companies. In 1924 he was elected vice president of the newly formed Wisconsin P&L. He was named president in 1933.

He also served as president of Edison Electric Institute in 1946-47.

JOHN E. CANFIELD

E. J. KALLEVANG

AG&E System . . .

. . . executive posts are filled by Prentice, Turner, and Cook. Seven named to directorships

The American Gas & Electric System has announced the following appointments:

A. N. Prentice, vice president and general manager of Ohio Power Co at Canton, has been elected a vice president and a director of Central Ohio Light & Power Co.

Harold Turner and Donald C. Cook, both executive vice presidents of the American Gas & Electric Service Corp in New York, have been elected vice presidents and directors of these companies: Applachian Electric Power, Indiana & Michigan Electric, Wheeling Electric, Kentucky Power, and Kingsport Utilities, Inc.

In addition, Cook was named a vice president and a director of Ohio Power and Central Ohio Light & Power.

New Directors . . . Paul D. Brooks, a vice president of the service corporation, was appointed a director of Ohio Power and Wheeling Electric. S. N. Fiala, chief engineer of the service corporation, was also named a director of Wheeling Electric. Brooks and Fiala are both located in New York.

These elections came about as the

result of the recent retirement of two service corporation executives: Graham Claytor, executive vice president-operations, and C. E. Moore, vice president and chief counsel.

American Gas & Electric Co's board membership was boosted to 11 with the election of two new members. They are former Governor John S. Battle of Virginia and Dr Courtney C. Brown, dean of Columbia University Graduate School of Business.

STREUBY L. DRUMM

West Penn Power Names S. L. Drumm Executive VP

Streuby L. Drumm, vice president of New Orleans Public Service, Inc, has been elected executive vice president of West Penn Power Co.

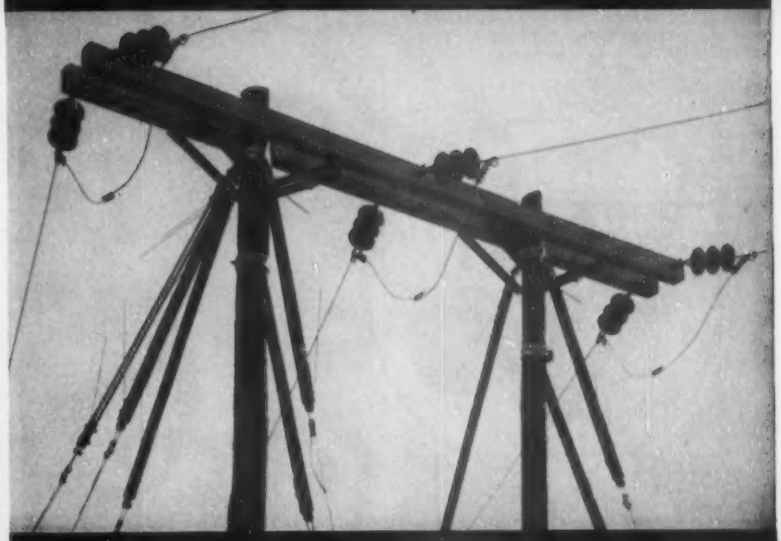
The new West Penn Power official has spent the last 31 years in the utility field since starting with Phoenix Utility Co of Arizona in 1923 as an assistant electrical engineer. Later he joined New Orleans Public Service, filling a number of sales positions. He was elected a vice president in 1949.

Active in industry organizations, he has been president of the Electrical Association of New Orleans, and chairman of the Better Light Better Sight Bureau. Just recently he was appointed chairman of the Commercial Division General Committee of Edison Electric Institute.

•

H. A. Glover has been named sales manager of the R&IE Equipment Division of I-T-E Circuit Breaker Co to replace **H. K. Wilcox, Jr,** who was moved to the position of assistant manager. Glover, formerly associated

PUT UP



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Round Pin Anchor

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THIMBLES

Wrought steel, galvanized, in both regular weight and heavy plow steel. Open Guy Thimbles stocked in ⅜", ½" and ⅝" sizes.

TURNBUCKLES

Sturdy drop forged steel, weldless, hot galvanized. Available in: (1) hook and eye, (2) eye and eye, (3) jaw and eye, (4) hook and hook, (5) jaw and jaw. Heavy reins with hex ends, precision threading. Exclusive eye design takes shackle one size smaller than turnbuckle diameter. Sizes (diameter & takeup) ¼"x4" to 2¾"x24".

These are only part of Laughlin's complete line of over 1500 types and sizes of wire rope and chain fittings. The line also includes safety hooks, wire rope sockets, swivels, double clevis links and weldless rings.
For complete data, ask for Catalog 155. Laughlin fittings are available through leading distributors everywhere.

Photo courtesy Charles E. Eaton

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• Since 1918 •

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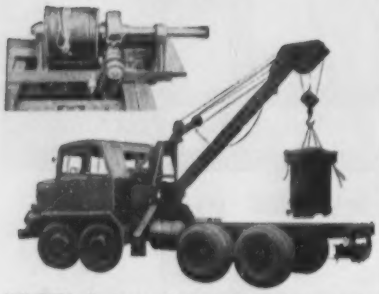

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with I-T-E from 1938 until 1946, has served the firm as Southeastern regional manager at Atlanta, Ga., since June, 1953.

C. C. FULLER

Fuller, Lafave Elevated by American Blower Corp

American Blower Corp has elected C. C. Fuller as vice president-treasurer and Arther V. Lafave as assistant treasurer and assistant secretary. They have both served in the financial branch of the business throughout their years of employment with the Dearborn, Mich., corporation.

Fuller joined the company in 1922. After filling various accounting posts, he became assistant treasurer in 1941. He served in that capacity until 1953 when he became treasurer and assistant secretary. He is also a director, treasurer and assistant secretary of Canadian Sirocco Co, Ltd, Windsor, Ont., a subsidiary of American Blower.

Lafave began with American Blower in 1936 as a cost accountant. Later he became manager of the cost department in 1941, manager of the Accounting Divisions in 1944, and was made assistant treasurer in 1953.

•

J. L. Anderson, Cordesville, S. C., has been elected president of Berkeley Electric Cooperative Inc, Moncks Corner, S. C., replacing **S. D. Gladden.**

J. Frederick Ransom has been appointed manager-product planning and market research of General Electric Co's Small Turbine and Supercharger

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Strong...
to support pole structures under adverse ice and wind loadings.

Rugged...
to withstand the punishment incurred in construction and service.

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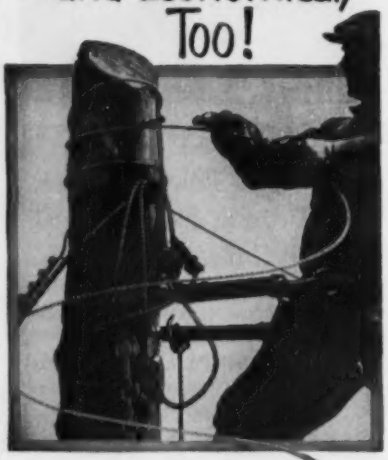

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INDIANA
STEEL & WIRE COMPANY
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Department. A graduate of Kansas State College in 1935, he entered the engineering training program of GE at Schenectady the same year.

Harvey F. McPhail, who retired this month from the Bureau of Reclamation, has joined Kuljian Corp, Philadelphia, as head of its Hydroelectric Division. During his 35 years' service with Reclamation, he supervised the design and construction of the generating systems of Grand Coulee, Hoover, and Shasta Dams.

Cornell-Dubilier Names Johnson a Vice President

Cornell-Dubilier Electric Corp has announced the election of Leslie A. Johnson as a vice president and his

LESLIE A. JOHNSON

appointment as manager of the new Sanford, N. C., plant.

Associated with Cornell-Dubilier since 1939, he started at the firm's headquarters at South Planfield, N. J. He was transferred in 1941 to the New Bedford, Mass., plant, to serve as assistant manager through 1945, when he went to the Worcester, (Mass.) Division. From 1947 to 1953 he was manager of the Worcester Plant.

•

Ralph Haywood has been named manager of the Hamlet, N. C., office of the Carolina Power & Light Co. He joined the company in 1942.

W. J. Thacker has been appointed manager of the newly created Power Capacitor and Control Section of the

Dependable . . .

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★ GUARANTEED

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Centralized control is much more effective if it brings a SENSE OF REALISM into the control room . . . if the operator can actually see what is going on outside his range of vision instead of depending upon indirect interpretations of operating conditions. The electric power industry has accepted the "Utiliscope" as an important factor in achieving better centralized control (as shown above).

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Sangamo Electric Co. He was previously associated with the General Electric Co in Pittsfield, Mass.

Smith Davis has been elected as an assistant treasurer of Southern California Edison Co. Davis, a tax accountant and financial analyst, joined the company in 1948.

James M. Hill, Jr, has been appointed purchasing agent for the Steam Division of Westinghouse Electric Corp. A graduate of Stevens Institute of Technology and Harvard Graduate School of Business Administration, he has been with Westinghouse since 1952.

Harold F. Webb has retired as general safety director of West Penn Power Co. He joined the company in 1923 as general safety director after 14 years as a safety engineer with I. E. du Pont deNemours Co and two national insurance firms.

R. G. Becker, assistant sales manager of the Clark Division of McGraw Electric Co, has been appointed sales manager. Prior to assuming the assistant sales managership in 1952, Becker was the division's district manager for the Northeastern territory for about five years.

Olin H. Ririe has been named assistant to the president of Utah Power & Light Co. Joining the utility in 1927, Ririe served as UP&L's Ogden Division manager from 1947 to 1953. Earlier he had been manager of the Southern Division, from 1941 until 1947. His prior service was as assistant personnel manager and in the accounting and commercial departments.

Assumes A-Power Post

Robert W. Hartwell has been appointed director of the Nuclear Power Development Department of Detroit Edison Co. He will report to Harvey A. Wagner, who has been filling the director's post as an additional duty and will now devote full time to his assignment as assistant manager of engineering for the utility. Hartwell, who started with Detroit Edison in 1940, has been serving as assistant director of the department since the first of the year.

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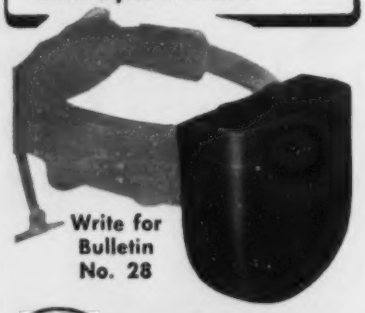
SAFETY POUCH

Worn attached to lineman's body belt, a practical container for nuts and bolts, wood and lag screws and other small parts. Sturdily constructed of water-repellent, close-woven canvas. Other styles available.



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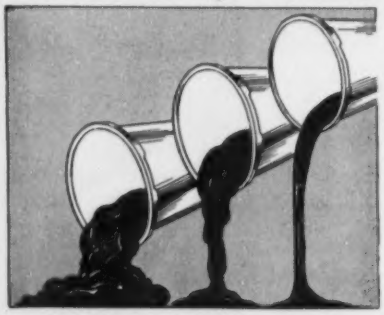

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OBITUARY

George M. Pollard, 52, general superintendent of electric operations for Niagara Mohawk Power Corp, died at Syracuse, N. Y., July 27. Pollard, who had worked for Niagara Mohawk Power and predecessor companies since 1923, was named to the superintendent's post in 1952.

Robert B. Grove, 68, retired vice president of Consolidated Edison Co of New York, Inc, was killed accidentally July 24 by a flying bandsaw blade while cutting wood on his estate in Briarcliff Manor, N. Y. Grove, a utility rate expert, had served Con Edison and its predecessors for 44 years. He was made a vice president of Con Edison in 1936, retiring in 1951.

Donald McMillin, 68, superintendent of the Rockville (Ind.) Electric Light Plant for 40 years, died July 16 at Terre Haute, Ind.

Earl C. Givens, 57, vice president of the International General Electric Co, died in New York City on July 20. He joined the General Electric Co in 1919 as a student engineer.

Leon A. Paddock, 75, retired president of American Bridge Co, a subsidiary of U. S. Steel Corp, died July 27 in Pittsburgh. Paddock joined the firm in 1927 as a vice president, later serving as president from 1931 to 1946.

William T. Pulterer, 70, a sales engineer for Simplex Wire & Cable Co, New York, died July 26 in Queens, L. I., New York.

Harold G. Jenks, 66, a retired electrical engineer of the New England Gas & Electric Service Corp, died recently in Boston. He was well known in the engineering distribution field.

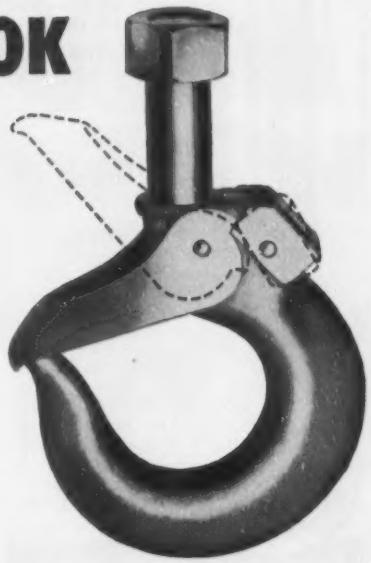
Walter J. Welch, 77, formerly chief design engineer of the Pioneer Service & Engineering Co, died July 13 at El Cajon, Calif. He had been with Pioneer for 37 years, retiring in 1947.

Harry A. Bovard, 51, assistant manager of the Lorain-Medina Rural Electric Cooperative Inc, Wellington, Ohio, died in Norwalk, Ohio, on July 11.

Look at the Safety and Convenience Features in

COFFING'S NEW

SAFETY HOOK



You are invited to compare this new Coffing Safety Hook, and see for yourself its many advantages — in safety to men and equipment, in convenience and ease of use.

POSITIVE LOCK under spring tension securely holds the latch in place.

NO SIDEWAYS MOVEMENT POSSIBLE, because latch fits snugly over point of hook.

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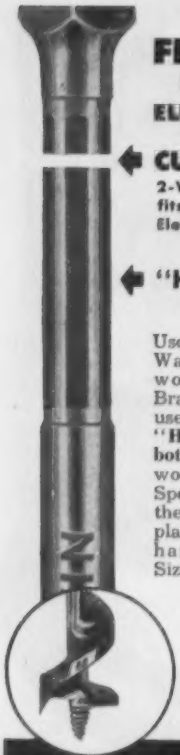

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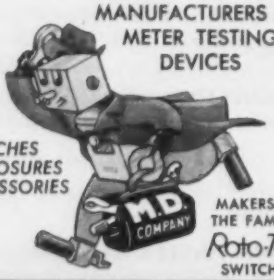

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20-Year Natural Gas Pact for Northwest Negotiated

A $100-million, 20-year contract expected to bring natural gas to Seattle by the end of 1955 has been signed by the Seattle Gas Co with Pacific Northwest Pipeline Corp, which has a Federal Power Commission permit to pipe the gas from the San Juan Basin of New Mexico.

N. Henry Gellert, president of Seattle Gas, foresees that, "the day will surely come in the Pacific Northwest when hydroelectric power will be supplemented by gas-generated electric power." He predicted that "few homes will be designed or constructed here in the future without being equipped for gas heating and other service."

Contract calls for Seattle Gas to get a maximum day's peak load of 40 million cf beginning the third year, plus an extra 10 million cf of a day for large-scale industrial purposes. The company has begun the first small units of a $14-million program to expand its distribution system.

U.S., Canadian Conferees Discuss Big Storage Dam

Possibilities of constructing a storage dam on the upper Columbia River in Canada, to provide additional power at downstream dams in the United States, were discussed by the Puget Sound Utilities Council at a meeting in Seattle, with Harold Crosby, chairman of the British Columbia Power Commission, and Garth Griffiths, the commission's distribution superintendent.

The proposed Mica Creek Dam would cost about $350 million and provide 10.5 million acre-ft of storage, twice that of Grand Coulee Dam. The Canadians admitted that most of the financing would have to come from the United States. A formula would have to be worked out for division of power which would be generated by water stored behind the dam during the heavy summer flow and released as needed in the fall and winter. Power from generators at the site also might be sold below the border.

The Mica Creek site is several hundred miles upstream from Arrow Lake on the Columbia, just north of

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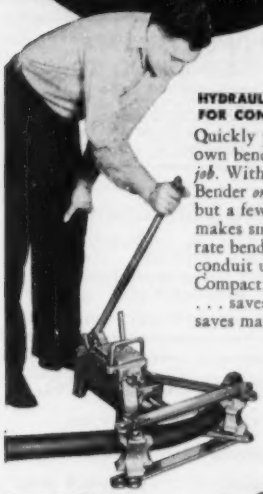

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the border, which the Kaiser aluminum interests have mentioned as a dam site. A dam at this location would store an estimated 3.5 million acre ft.

Representatives of the Utilities Council expect to confer on the Mica Creek project shortly with Robert E. Sommers, British Columbia minister of lands. The Council is composed of Seattle and Tacoma City Light, Puget Sound Power & Light Co, and Chelan and Snohomish County PUD's, who presumably would divide any additional power that might become available in this country from Mica Creek.

Plans Being Formulated for EEI Labor Parley

Final plans and arrangements are being formulated for the Annual Round Table Conference of the Industrial Relations Committee of the Edison Electric Institute, D. A. Bartlett, chairman of the 1954 subcommittee, declared in New York last week. He said the conference will be held at the Palmer House, Chicago, Ill., Sept. 27-29.

Registration will be limited to about 200. Those interested in attending, should contact E. S. Evans, Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

Public Service E&G Starts $100-Million Steam Plant

Construction has been started by Public Service Electric & Gas Co, Newark, N. J., on a $100-million generating station in Linden, N. J.

Located on a 120-acre tract adjacent to Bayway Refinery of Esso Standard Oil Co, the new station will provide added power for utility's system and also furnish electrical and steam needs of the refinery, which will supply fuel for the station by pipe line.

The addition, whose boilers and furnaces will be outdoors, will house a 225,000-kw turbine-generator unit, which is scheduled for operation in 1957. To date, it has not been decided whether the turbines will be outside. A second similar unit will be added in the fall of that year with four slated to be added when needed.

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Advertising In This Issue

Air Preheater Corp., The..... 26
Allen-Bradley Co. 59, 60
Allis-Chalmers Mfg. Co.....2nd Cover
8, 19, 30, 31, 55, 74, 75
American Brass Co., The..... 41
American Electric Mfg. Co..... 169
American Telephone & Telegraph Co. 61
Anaconda Wire & Cable Co..... 33

Bakelite Co., Div. Union Carbide & Carbon Corp..... 42
Bethlehem Steel Co..... 48
Blackburn Corp., Jasper..... 36
Brown Co. 142
Bullard Co., E. D..... 160
Bussmann Mfg. Co.....24, 25

Cable Spinning Equipment Co.... 157
Chance Co., A. B.....140, 149
Chase Brass & Copper Co..... 70
Coffing Hoist Co..... 171
Cole Electric Co..... 178
Control Corporation 151
Cornell-Dubilier Electric Corp.... 62
Crescent Tool Co..... 56
Crouse-Hinds Co. 46

DeLaval Separator Co..... 51
Diamond Power Specialty Corp... 170
Directory of Engineers..... 174
Dossert Mfg. Corp..... 173
Driver-Harris Co. 63

Ebasco Services, Inc..... 43
Electric Service Mfg. Co.....64, 65
Electric Storage Battery Co..... 32
Electrical Testing Laboratories, Inc. 34
Electroline Company 5
Engineers, Directory of..... 174
Everstick Anchor Co..... 155

Federal Electric Products Co. 3rd Cover
Foster Wheeler Corp..... 29
Foushee & Heckendorn..... 169

G&W Electric Specialty Co..... 57
General Electric Co.
Apparatus Dept. 68, 109, 110
111, 113, 115
Electronics Div. 52

Gould-National Batteries, Inc..... 159
Greenlee Tool Co..... 173
Grip-Tite Mfg. Co..... 169
Guth Co., The Edwin F..... 138

Hazard Insulated Wire Works... 4
Holophane Co., Inc..... 121
Hubbard & Co..... 147

Indiana Steel & Wire Co..... 168
Industrial Products Co..... 170
Inet Div., Leach Corp..... 148
Ingersoll-Rand 139
Irwin Auger Bit Co..... 172
I-T-E Circuit Breaker Co. R&IE Equipment Div..... 35

KPF Electric Co..... 66
Kaiser Engineers Div. Henry J. Kaiser Co. 137
Kerite Co., The..... 76
Kidde & Co., Walter..... 40
Kimble Insulator Co., sub of Owens-Illinois 37
Kuhlman Electric Co.....4th Cover

Lapp Insulator Co., Inc..... 53
Laughlin Co., The Thomas..... 167
Leeds & Northrup Co..... 123
Locke Dept. General Electric Co. 22, 23

Mallory & Co., Inc., P. R..... 54
McCabe-Powers Auto Body Co... 9
Meter Devices Co..... 172
Minerallac Electric Co..... 170
Minneapolis-Honeywell Regulator Co., Industrial Div.....72, 73
Moloney Electric Co.....144, 145

Ohio Brass Co..... 119
Okonite Co., The..... 4
Orangeburg Mfg. Co., Inc..... 14
Osmose Wood Preserving Co., Inc. 172

Pacific Electric Mfg. Corp..... 11
Page Fence Association..... 172
Page Steel & Wire Div., Amer. Chain & Cable Co..... 161
Pennsylvania Transformer Co..12, 13
Phelps-Dodge Copper Products Corp. 44, 45
Pioneer Service & Engineering Co. 47
Pittsburg Reflector Co..... 165
Porcelain Products, Inc..... 150

Revere Copper & Brass, Inc..... 117
Richardson-Allen Corp. 152
Riley Stoker Corp.....16, 17

S&C Electric Co.....6, 7
Searchlight Section 176, 177
Shell Oil Co..... 69
Silent Hoist & Crane Co..... 168
Simplex Wire & Cable Co..... 10
Socony-Vacuum Oil Co., Inc..... 15
Sorgel Electric Co..... 50
Southern States Equipment Corp. 28, 49
Stone & Webster Engineering Corp. 153
Sylvania Electric Products, Inc... 18

Thompson Electric Co., The..... 156
Triangle Conduit & Cable Co., Inc. 20, 21

Union Carbide & Carbon Corp., Bakelite Div. 42
United States Rubber Co..... 67
United States Steel Supply Div. United States Steel Corp..... 58
Uptegraff Mfg. Co., R. E..... 71

Wagner Electric Corp.....38, 39
Western Precipitation Corp..... 141
Westinghouse Electric Corp..... 125
126, 127, 128, 129, 130, 131
132, 133, 134, 135, 136
Wheeler Reflector Co..... 27
White Motor Co..... 154
Wiremold Company, The..... 143

■

PROFESSIONAL SERVICES 174

■

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 176
Selling Opportunities Offered..... 176
Positions Wanted 176
Employment Services 176

EQUIPMENT
(Used or Surplus New)
For Sale 177

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3— 333 KVA W-H 6600-2300
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1000	General Motors	16-567B	1440	720	300	General Motors	8-268A	450	1200
750	General Motors	12-567	1080	720	200	General Motors	8-268A	350	900
700	Worthington	EE-8	1000	327	150	Worthington	CC-4	225	450
500	General Motors	8-278A	750	720	150	Ingersoll-Rand	8-4	225	600
500	General Motors	8-567	720	720	150	Buckeye	80	240	600
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1	—2000	G.E.	500	666 2/3 cr.	11000
2	—2000	G.E.	450	600	2300/4600
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1	—1500	G.E.	720	600	13200
1	—1000	G.E.	900	260	4100/6900
2	—1000	Whse.	900	600	2300/4150
3	—1000	G.E.	720	600	2300/4600
1	—750	Whse.	900	275	2300/4150
1	—500	Whse.	1200	125/250	2300
1	—500	Whse.	900	250	440
1	—500	G.E.	720	125	2300

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2	—2500	G.E.	25/62½	2300 x 4150
1	—1250	G.E.	25/58.3	4400 x 2300
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1—1500	G.E.	HT	3	13200 x 2300
3—1250	G.E.	HVDDJ		6600/550
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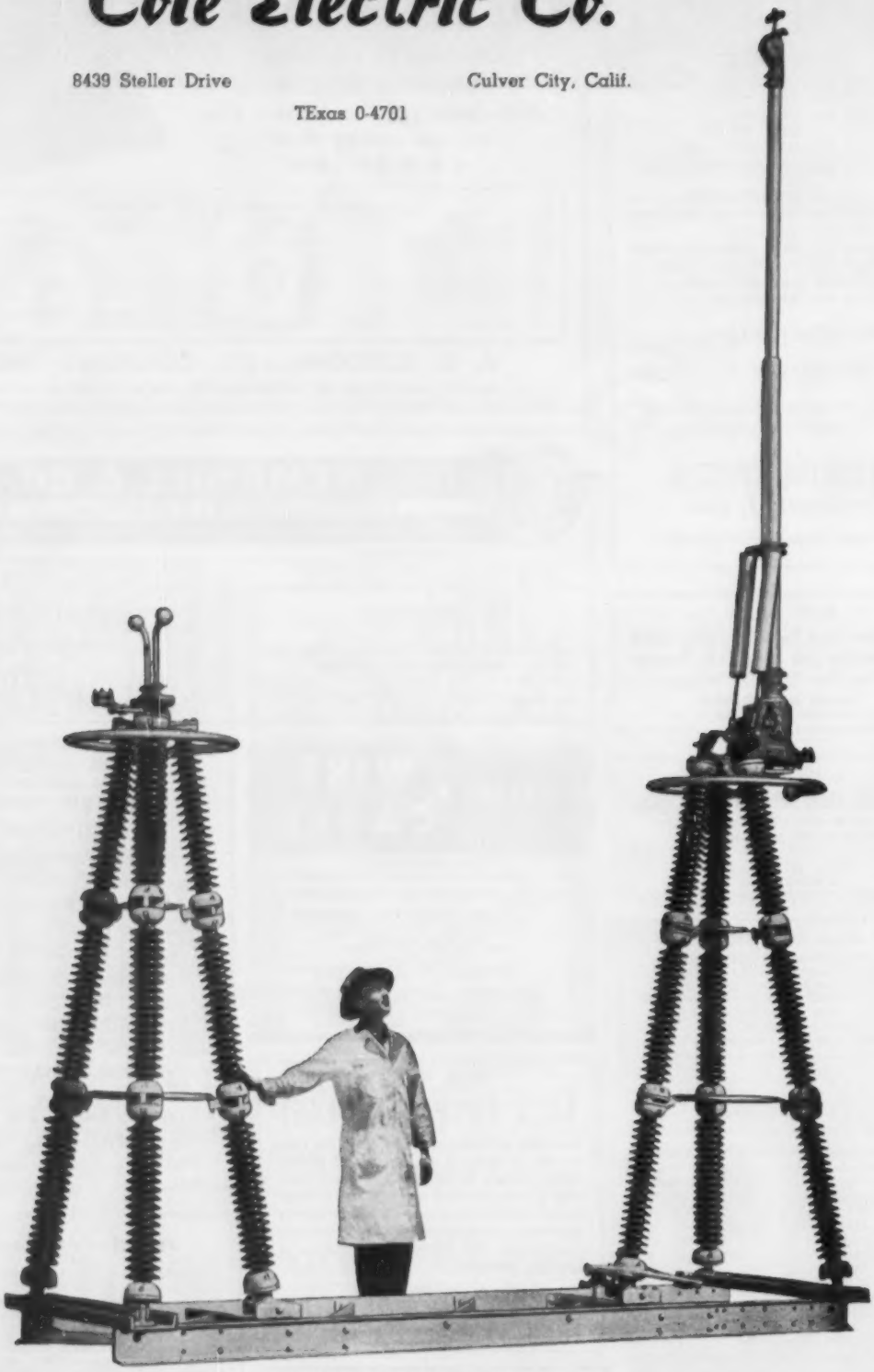

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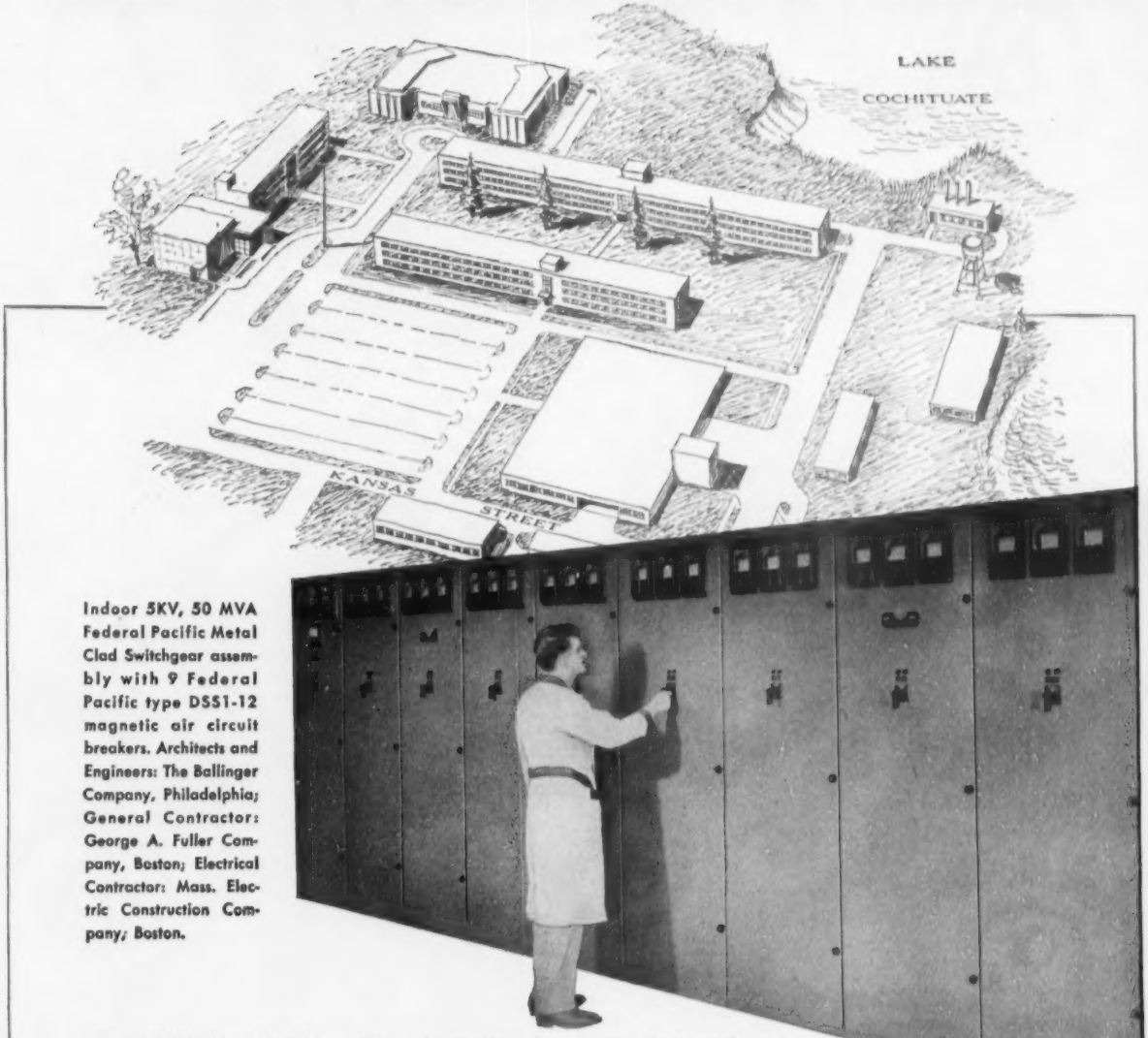

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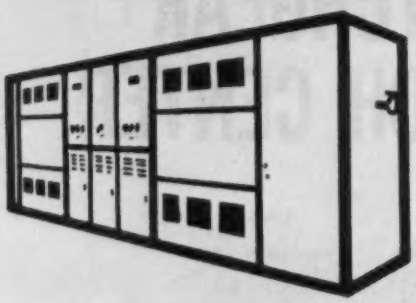

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